The FOUNDRY

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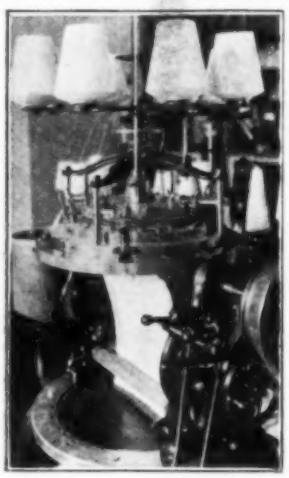
While Clothes Make the Man Castings Make the Clothes

TEXTILE mills, as we think of them today, did not exist in America previous to 1800, since the manufacture of clothing was carried on chiefly in the home and the spinning wheel and hand loom were familiar in the average household. Finer clothes were imported, chiefly from England, where a number of remarkable textile machines had been invented and the industry was well advanced. Several young



This Machine Seems Almost Human as It Goes About Its Business of Knitting Fabrics

Englishmen, with a thorough knowledge of the industry, emigrated to this country early in the nineteenth century and built machines similar to those used in the Old World. From that time the textile industry grew rapidly, production being accelerated by improvements made on the machines by American machinists and inventors and by the embargo during the war of 1812. Today the industry ranks high in the value of merchandise produced, and in 1923, the manufacture of cotton goods alone stood fifth among the largest of the country's products. Much of the credit for the growth of this industry belongs to the foundry industry, since even the early machines made in this country were constructed of cast parts, and many castings are required in the complicated mechanisms of today. The magnitude of textile manufacture may be realized when it is known that in a recent year the value of new machinery and parts made in the United States was $140,661,358.

Find Where Castings Can Be Sold

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100 YEARS

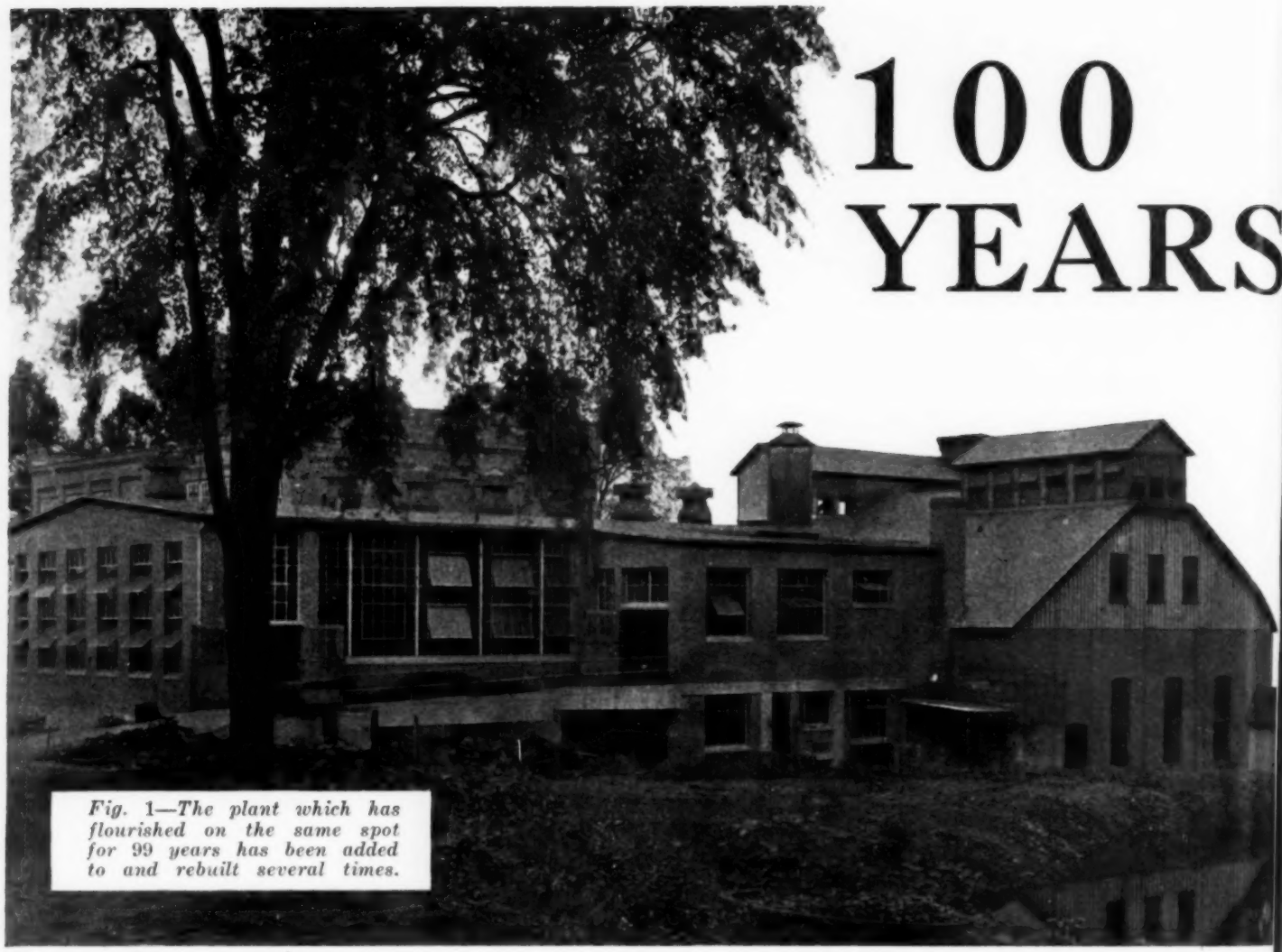


Fig. 1—The plant which has flourished on the same spot for 99 years has been added to and rebuilt several times.

WITHIN a short time the little town of South Windham, Conn., will celebrate the one hundredth anniversary of the founding of its chief manufacturing plant and incidentally the reason for the town's existence. About 1824 the first European paper making machinery was brought into New England and set up near the present town of Windham, Conn. This little plant claims the distinction of turning out the first American made paper. The process aroused much interest among the inhabitants of the district. Eventually, one Charles Smith, mechanically minded and not satisfied with watching the operation of the foreign machinery, decided to build paper making machines of a similar design. He interested others in his plans and early in 1827 built a plant and started making paper mill machinery at the present site of the Smith & Winchester plant in South Windham.

The first paper mill equipment completed at this plant was shipped by ox team to a manufacturer in Maine and was nearly a month on the road. Sentimental interest in the early history of the plant and the fact that it spans the long interval between oxen and motor truck, induced the Smith & Winchester Co., to adopt a picture of a pair of oxen as its trade mark. A team of oxen also is kept at the plant as an advertising feature.

South Windham is not located on a railroad and this fact curiously enough is associated with the ups and downs of the company's existence. In early days when railroads were unknown outside the great centers, the plant was on an equal footing with others in small inland communities. The railroad by favoring other communities later gradually exercised a handicap over the activities of the South Windham plant. Long experience in making paper mill machinery overcame the handicap for many years, but eventually the business began to fall off. Descent was arrested and the business once more placed on a firm basis by the development of the motor truck which has placed the plant again on a shipping equality with those situated in railroad towns.

The present foundry is the result of gradual extension and development. Part of the main floor belongs to a building dating back 50 years or more. Another part of the building is of modern construction completed two or three years

Marks Span of *Eastern Shop's Service*

By H. R. Simonds

Fig. 2 — The original twin cylinder prime mover

ago. Both parts of the foundry building are shown in Fig. 1. It may be noted that advantage has been taken of the slope of the land to construct an almost level runway from the stock yard to the charging floor. Provision has been made for two cupolas, but only one has been erected up to the present.

The old section of the foundry is served by a wood jib crane which despite its age still is excellently adapted to the work. Recently a small variable speed motor attached to the driving pinion has replaced the old hand crank. Within fairly wide limits the speed of hoisting and lowering may be regulated at will. The new section of the foundry is served by a modern overhead traveling crane made by the Northern Engineering Works, Detroit.

A modern, large paper making machine is essentially a series of steam dryers. It is not uncommon for a machine to have from 60 to 70 of these hollow cylindrical castings 30 or more inches in diameter and any length from 5 to 20 feet. The walls of these castings must be thin to facilitate the passage of heat from the steam on the inside to the layer of wet pulp on the outside. The metal must be close grained and free from cracks or other imperfections thus involving more than ordinary care in the various foundry operations. Satisfactory iron conforms to the following analysis: Silicon 1.70 per cent; sulphur 0.08 per cent; manganese 0.69 per cent; phosphorus 0.48 per cent. On the standard test bar broken on the usual 12-inch centers this iron shows a transverse strength of approximately 3100 pounds.

At the Smith & Winchester foundry the mold is made in a round cast iron flask of many sections. The method pursued is relatively simple, but each step must be watched closely to insure acccuracy of fit between the mold and the core. A cast-iron ring about 3 feet in length and the diameter of the required casting plus contraction, is used for a pattern. It is centered upon a raised seat on a suitable pattern plate. This raised seat forms a circular recess in the bottom face of the mold which later serves as a guide in locating the mold around the core.

A flask section is lowered into place around the pattern and rammed full of sand. A second section of flask is placed on top of the first and the pattern is drawn up until the upper edge is flush with the top of the second flask section. The second flask then is rammed full of sand and the process is continued up to the required length of the casting. Each time the pattern is drawn up, a sufficient part remains in the rammed sand to keep it in line. A level and a long stick with feet and inches painted on the face are employed to check the accuracy of position of the pattern at each shift.

A mixture of local and New Jersey sand is used for the molds. The brick core is built up independently to approximate diameter and then a coating of loam about ¾-inch thick is swept on by a board attached to a vertical spindle. The core is built in a pit 5 or 6 feet deep located near one end of the foundry floor. The completed mold and core are loaded on small, low cores cars in an upright position as shown in Fig. 7 and then are pushed into a special oven 18 feet high, 7 feet wide and 22 feet in length built close to one side of the cupola. The oven is fired with coke and develops sufficient heat to dry the molds and cores over night.

On the following day the core is lowered into a pit where the foundation plate rests on the bottom. On account of the small amount of clearance between the wall of the mold and the core it is essential that the core be plumbed accurately before attempt is made to lower the mold into place. A dough or clay worm, or a daub of paste around the seat at the bottom of the core insures a close fit and prevents the metal from leaking through later. The upper end of the core is centered accurately by a templet attached to the upper flange of the flask. From 1 to 4 tons of metal are required to pour the mold, depending on the size of the dryer poured.

Pouring equipment includes one 3-ton and three 2-ton ladles. For a 4-ton cylinder the 3-ton ladle is filled first and then held with the metal under a covering of charcoal until the remainder of the metal needed for the casting is tapped into one of the 2-ton ladles. Both ladles then are picked up and poured simultaneously.

The casting is poured through a ring of pop gates. Two main runner basins 180 degrees apart are used to accommodate both ladles. On smaller sizes only one basin is used to supply a circular runner extending all around the top of the mold. Metal rises over a skimming ledge and then drops through a number of slots spaced equally around the top opening between the mold and the core. The mold is set up perfectly vertical and the gates are designed to drop the metal plumb and thus avoid any undue impinging on the wall of the mold or core.

Hot Iron Required

Metal is poured at an unusually high temperature determined by the experienced eye of the foundry superintendent. A rather interesting feature was noted along this line about 2 years ago, at the time the foundry was expanded and remodeled. Losses were erratic to such an extent that the plant manager, Walter Abbe Jr., did some carful checking and found among other things that the losses were heaviest on dark days. With this clew the trouble was traced to large windows placed in such a position in the new foundry that the sun shone almost entirely on the cupola spout and ladle at the time the melter was judging the temperature of the iron, preparatory to pouring.

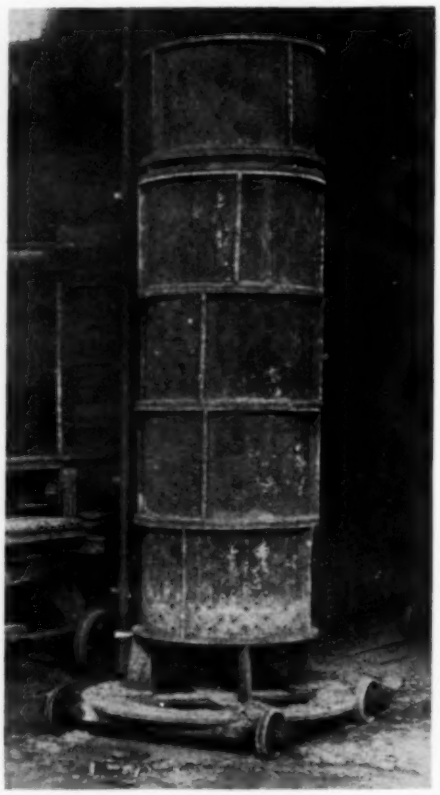


Fig. 3—Molds for the dryer shells are made in round iron flasks of many sections

In contrast to the bright light the molten iron in the ladle looked cooler than when viewed on a dark day. Therefore bright day pouring was done at a higher temperature. To correct the trouble, screens were put up and artificial light was used whether the day was bright or dull. In this way conditions were standardized and the observer's eye had a uniform basis of comparison. A few days were sufficient to determine the correct temperature under the new conditions and since that time losses have not varied in sympathy with changes in the weather. The usual method for pouring the miscellaneous small castings is to fill one of the large ladles at the cupola spout and take it with the traveling crane to a suitable point on the gangway where the small ladles are filled.

An extension of 4 inches is allowed on the bottom of the dryer shell and 12 inches on the top to take care of any dirt inclusions or porosity. These extensions are cut off later in the machining process.

Machining the Cylinders

The casting is made with a narrow internal flange at each end to which heads are bolted later. Due to the length of the cylinders some lttle difficulty was experienced at one time in drilling and tapping these flanges. The operation has been simplified by providing a pit close to one of the boring mills. The casting first is swung in a special sling at its center as shown in Fig. 5 and then up ended as in Fig. 4. It then is lowered into the pit where it rests on a revolving table at the bottom while the drilling and tapping are progressing. Holes for stud bolts are drilled only part way through the flanges. After one end is finished the cylinder is lifted out of the pit, tipped end for end and replaced in the pit. One cylinder head is solid and the other contains a bushed opening for a steam pipe connection.

After the end flanges have been drilled and tapped they are fitted with accurate centering heads which re-

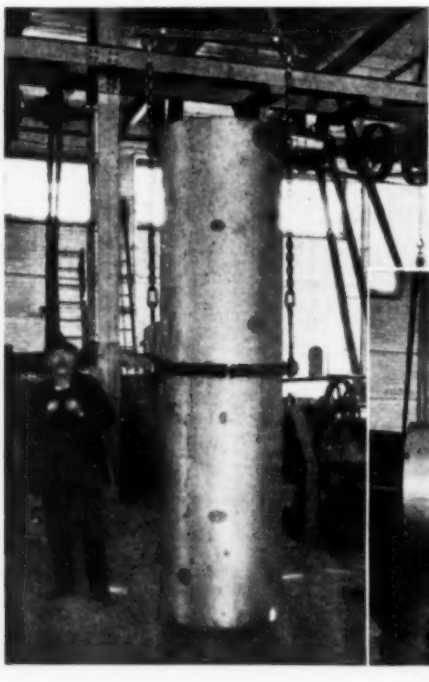
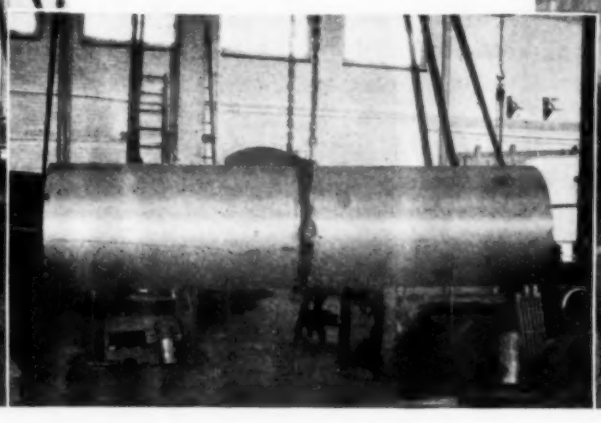


Fig. 4—Left—The casting may be tipped either end up

Fig. 5—Below, the cylinder is gripped by the center in a special sling

Fig. 6—Right, the cylinder rests on a revolving table in the bottom of the pit



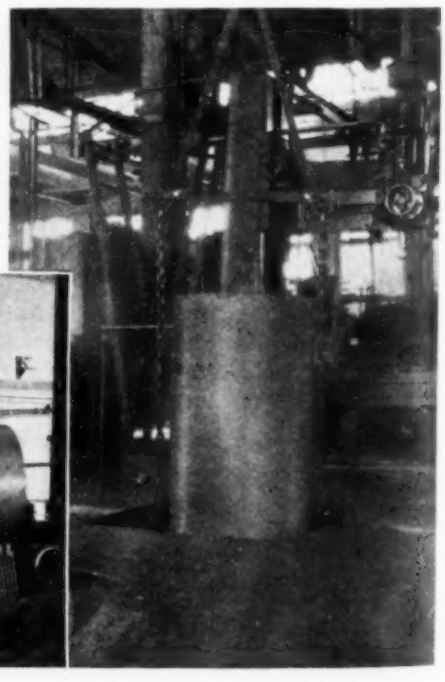


Fig. 7—General view of part of the interior looking toward the old part of the foundry. A mold and core for a dryer shell are shown loaded on special cars close to the high core oven

main bolted in place until the casting first is rough and then finish turned to a perfect balance in the lathe. Cylinders are polished in various ways. One method is by using a hand lever free to slide back and forth over the length of the casting and by which an abrasive block is pressed against the revolving surface. Another method is practiced on an old home made polishing machine built in the shop so long ago exact date of its origin is unknown. The tool undoubtedly is one of the first ever built for grinding cylindrical castings. The casting is mounted between centers as in a lathe. The grinding wheels are mounted on a movable carriage which brings them into simultaneous contact with opposite sides of the cylinder. The position of the grinding wheels is individually adjustable so that a deeper cut, if necessary, may be taken by one than by the other.

Although old the machine does remarkably accurate work. The grinding wheels are belt driven from long overhead drums on which the belts travel back and forth with the movement of the carriage.

Castings for cylinder heads, pumps, frames and practically all other parts entering into the construction of paper mill machinery are made in this plant. In addition the foundry turns out castings for auxilliary machinery for paper cutters, paper bag makers and pulp grinders. Metal for all the nonferrous castings used in connection with the company's output of paper and pulp mill machinery is melted in a battery of four coke fired crucible pit furnaces.

The old pattern storage building dates back to 1835. Practically no patterns have been destroyed in the history of the plant and the result is seen in thousands of curious specimens of old time patterns on the shelves. A modern concrete pattern shop recently has been built, but the old storage house is maintained in-

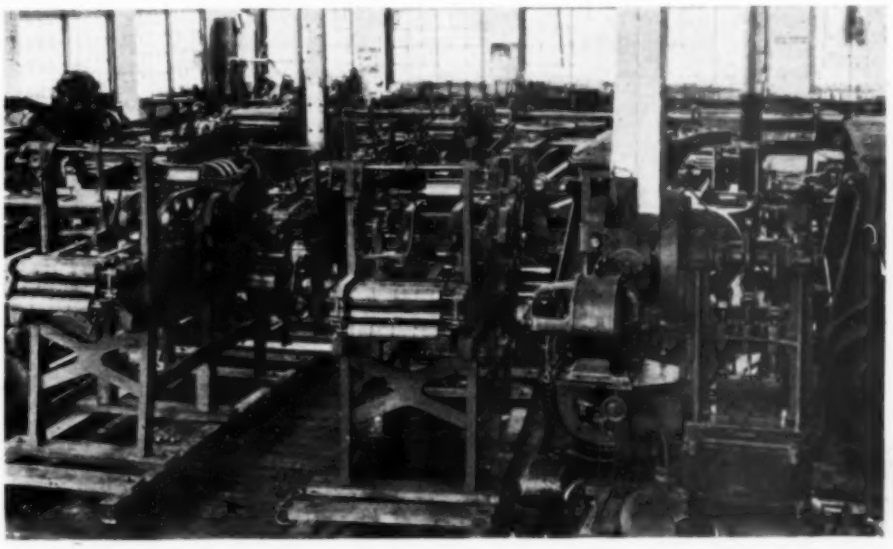


Fig. 8—Part of the shipping room showing a number of bagmaking machines waiting to be crated and shipped

tact, partly as an exhibit and partly because of occasional calls for old patterns.

Recently a man called up in a hurry to report that a certain clutch had broken and he wanted a new one immediately. A search of the old books showed that the clutch had been ordered, made and delivered 50 years ago. After a little search in the pattern storage the patterns were found and new parts cast and shipped to the customer. Many of the patterns are works of art made by the famous old cabinet makers of ancient New England. Although they bear dates in many cases antedating the civil war they are in just as good condition today as they were the first day they appeared in the foundry.

Harbison-Walker Sales Co., Pittsburgh, has established a direct branch at 28 South Canal street, Milwaukee, in charge of H. T. Lewis.

Book Review

Cost Accounting In The Iron Foundry (Die Selbstkostenrechnung in der Eisengiesserei), by Dr. Ing. A. Lischka, 82 pages, 6¾ x 9¾ inches, paper, published by R. Oldenbourg, Munchen and Berlin, Germany, and supplied by THE FOUNDRY, Cleveland, for $2.00; 2-3 Caxton House, Westminster, S. W. 1, London, England for 10s.

This book which is printed in German, deals with the various phases of cost accounting as encountered in the foundry. The author has combined theory with practice, and to make the contents more easily assimilated he has divided the work into four main sections. The first section deals with securing the most important cost, followed by sections on the importance of securing departmental cost figures; methods of cost figuring, and statistics. These main divisions are subdivided and consider general costs, wages, material, buying, maintenance, consumption, etc. A bibliography of literature on cost accounting referred to in the text is presented at the end of the book.

Readers of German will find much to interest them in this work although it refers to German foundry methods of accounting.

Change Exhibition Plans

At a recent meeting of the Association Technique de Fonderie in Paris, France, it was decided not to hold a foundry congress in France during 1926. This decision was caused by the fact that an international foundry exhibition under the auspices of the Syndicat General des Fondeurs will be held in 1927, and with the patronage of the French foundry association particular importance will be given to the 1927 convention which will be held in conjunction with the exhibition.

Code of Ethics of Southern Metal Trades Association

(Adopted May 5, 1926)

IN THE conduct of our business and in our relations with our competitors, our customers and our employes, justice and fair dealing should characterize every transaction.

In the realization that higher business standards are to be attained through the education of our members, let each maintain an open mind toward all things which tend to better business practices.

Prove to our competitors that we are as sincere and honest in all matters as we could wish them to be.

Take no advantage of the ignorance of a customer, nor allow any employe or salesman to do so.

Make no estimates without knowing clearly all details connected with the work to be done, that there may be avoided any misunderstanding or disagreements with customers incident to *extra charges.*

In our dealings with our workmen, let us ever be mindful that there is resting on us, as employers, a grave responsibility, for we should by example and precept endeavor to inculcate the highest ideal of manhood and character, and emphasize the responsibility of every thinking man as a citizen of the United States of America, for the rightful discharge of his duties thereunder.

Hiring employes away from a competitor, or inducing them by other means to leave his service, must be recognized as a sure way to invite reprisal and a general demoralization of the local labor conditions. It is unquestionably the right of the workman to use all reasonable efforts to better his condition, but employers can do one another or the employe no greater wrong than to virtually become *bidders* for his services.

A fair wage for a fair day's work should be the thought in fixing rates of pay of our employes, having also due regard to general living conditions. Securing a fair profit on all work we do is doubly necessary—for the protection of the employer, and the just remuneration of the workman, that he may maintain himself under such proper living conditions as will conduce to good citizenship and good workmanship.

We should recognize that only by training all the apprentices which trade customs allow, can there be maintained a sufficient body of trained workmen in this industry, and that it is the duty of every employer to do his share in this most important work. Therefore, the selection of apprentices should not be left to chance, but rather be given the careful study of the employer himself, to the end that the industry be not harmed by the introduction of unsuitable or undesirable employment. When an apprentice is taken into the shop much care should be taken in seeing that he be properly trained and given the opportunity to become a thoroughly proficient workman.

We desire to promote the metal trades business for the general good of the entire industry and the welfare of our country.

To refuse to pay bribes or *commissions* to buyers, purchasing agents or others who may thus be induced to place orders with us. Business so acquired is sure to develop undesirable characteristics.

We believe in publicity and research, the education of all branches of the industry to the highest standards, and in the dissemination of the proper knowledge of the economic uses of such material that enters into the production of all metal products.

And, finally, let the metal tradesman be ever diligent in business, quick to perceive the good and alert to repel the evil; ever mindful of the rights of others; as quick to take blame as to place it on others; courteous and considerate of others, particularly if they be less fortunate than himself; and in every way a true American citizen.

Are You Playing Fair
With Your Stockholders?

Faulty Merchandising Responsible for Business Ills of the Foundry Industry—Sacrificing a Profit in the Interest of Increasing Output Is Fatal Error

By S. W. Tetley

THE principle behind the formation of any corporation is the making of a profit for the individuals who as stockholders contribute their stored-up labor, crystallized in the form of capital. This is the purpose for which the corporate form of organization was created and it is its only excuse for it existing. The laws of most of our states recognize this fact and make it a crime to sell stock in a corporation unless it can be shown that there is at least a reasonable chance of the corporation being a success, provided it is properly administered and operated.

The men who put their money into our own plants were not interested primarily in getting tonnage, in seeing the metal flow, in taking care of customers, or in any of our daily problems; but they were interested in making a profit on the money they advanced. Of course, the only way a manufacturer can accomplish this end is to serve society through producing that which it needs and is willing to pay for. As managers, we should bear in mind clearly that our main job is not to perform this service, but to make a profit for those who have entrusted the handling of their money to our care. When I speak of a profit I do not mean mere banking interests, such as it carried by a bond, but rather such an interest, for the use of money invested, *plus* a reward for taking a risk in a highly competitive industry. This, after all, is the real definition of profit as the economist knows it. Our question, then, can perhaps best be stated in a little different manner, namely:

"How can we merchandise steel castings at a price which will enable us to produce a profit for our stockholders?"

To a man outside a manufacturing industry, this seems to be a simple matter that easily may be remedied. He says:

"You ought to know what your costs are, and knowing that, you shouldn't take a job unless there is sufficient margin to net a profit."

Rosy In Theory

Unfortunately for the manufacturer, there are other considerations which must be met. To be profitable, a plant must operate, it cannot lie idle. To operate it must have orders, for it is the customers' money and not the stockholders' that meets the payroll and pays for material. Merely to close one's doors because of lack of work does not stop losses by a long way, and and as the volume of output decreases the unit cost increases, so that it is more and more difficult to keep costs below selling price.

Each manager has about him an organization of fellow-beings upon whom he is absolutely dependent for the operation of his plant, and who in turn, being specialists in one line of industry, are largely dependent upon him for their means of livelihood. No manager worthy of the name intentionally will disregard the welfare of these men, nor by allowing his plant to close, save as a last resort, refuse to recognize his responsibility to them.

Besides this, each plant has a certain number of customers whose castings it is bound either by contract or mutual understanding to furnish as required. To these customers a foundry is somewhat akin to a public service corporation, although, unfortunately, it is unlike many of the latter, in that it cannot demand that its customers pay a large part of its overhead for the privilege of having it *stand by* ready for use when required.

To close in dull times and refuse to take customers' work, causing them to remove their patterns elsewhere; to lose an organization of able men, carefully builded together by years of experience, means a loss which cannot be made up save by years of the hardest kind of effort. Therefore, many times, the ablest and most intelligent management feels forced to forget the margin between cost and selling price in an effort to get sufficient tonnage to keep the shop going, and the organization together, while the less intelligent management, rushing headlong through the field of customers, quoting all kinds of ridiculous prices, apparently thinks that in some miraculous manner it will be able to make a profit, if only it can secure sufficient tonnage at prices netting less than cost. Verily, under a great many circumstances, the question of whether to refuse an order because the price is too low to make a profit, or to accept it in order to boost work in the shop, is exceedingly difficult, and too often is answered by sacrificing everything for the sake of additional tonnage.

It is extremely easy to say that castings should be merchandised on the basis of cost plus a fair profit. Our ability to put this principle into operation is what determines between success and failure. No formula yet has been devised which alone automatically makes for success. Cost estimating in a jobbing foundry cannot be considered an exact science, and it must be supplemented with considerable judgment and knowledge of conditions in the industry. Do not misunderstand me in this statement, and do not think that I would suggest the elimination of cost estimates as this is far from my thoughts.

The work of the Steel Founders' Society of America along cost accounting lines has been of inestimable value to its members. The advantage of uniform principles of cost finding, the advantage of comparing cost data on similar manufacturing opera-

tions among different companies, giving to the small individual plant many advantages hitherto possessed only by larger organizations made up of several units, is too obvious to need discussion. I urge every man to study his costs with increasing intensity, for he will learn much from them, but I think that a cost estimating formula *alone* does not constitute the key to the marketing problems of an individual company. There are other important factors to be considered.

The foundryman who would market his product satisfactorily must visualize the industry as a whole. He must realize that just as modern battles are fought by whole armies, rather than by battalions and regiments, so modern business is conducted by whole industries intead of by individual plants. He must realize that in an industry where a man does not have a particular, definite article to sell, which differs materially from that offered by his competitor, no one has the absolute power to fix his own prices, for prices are fixed by the entire industry.

The foundryman must realize that he has a duty not only to his own stockholders, but to his competitors as well, and that only by fulfilling his duty toward the latter can he fulfill his duty toward the former, for the latter, after all, determine quite largely the price for which he has to sell his product. Cain's old cry, *Am I my brother's keeper*, daily is raising itself in industry, and thoughtful business men are coming to realize that to some extent at least only by being the keeper of one's brother can one be sure of his own industrial salvation. I often think of the remark made by one of our members when he said,

"Just remember that by and large you can't make money yourself unless your competitor is making it, too."

The more I think of it the more I am convinced that it is sound economic reasoning, and that this is a principle which should underlie much more of our action than it does.

Our cheap and efficient transportation, our rapid and dependable communication by which we can talk across the country as easily as we talk across the street, and the whole thought of our modern industry has widened our field tremendously. I thing it is safe to say that our own company, located about midway between the Atlantic and the Mississippi river, comes in active and definite competition sometime in every year with every steel foundry lying north of the Ohio river line between the Hudson river and the Father of Waters, and that in many, many instances we compete with foundries far outside of these limits. The mental attitude of the manager of each one of these institutions, the action which he takes, has a definite and positive influence on our marketing problems; and on the other hand, those things which we do definitely and more or less directly affect each one of these other institutions. We may not be able to take away a customer from a plant located 500 miles from us, but quite often we name the price at which that plant has to take its own customer's business, and it or some other plant too often names the price at which we have to take our business.

One of the great needs of most industrial managers today is to put more emphasis, not on the duty his competitor owes him, but rather on the duty he owes his competitor, and to realize that many other things besides charity begin at home. The bigger and stronger the plant, and the higher the standing of its management, the greater the disastrous

Author Is Well Grounded in Merchandising Practice

STUART WELLS UTLEY, the author of the paper prepared for the Steel Founders' Society of America, which is abstracted in this article, is well qualified to speak with authority on the subject of sales practices and the handicaps which confront the seller of castings. For the past twenty-five years he has been identified actively with the foundry industry, first with the American Radiator Co., Detroit, and later with the Detroit Steel Castings Co. where he was successively cost clerk, purchasing agent, assistant secretary, secretary, and finally vice president and general manager. Mr. Utley is a director of the Steel Founders' Society of America, vice president and at present presidential nominee of the American Foundrymen's association. This paper which presents the author's personal views in a clear and forceful manner is made available through the courtesy of the Steel Founders' Society.

effect of poorly-studied and uneconomical methods of merchandising. Mistaken policies on the part of small and weak companies often can be survived, but when such policies are backed by concerns of unquestioned resource and ability they are almost unsurmountable.

In the early days of the steel casting industry, it was the general custom for a foundry to make a contract with a customer at a flat price per pound. Contracts with the rolling mills, for instance, were made on the basis of 3.50 cents per pound for anything the customer required. Contracts with the railroads were made at blanket figures as low as 3.25 cents this to cover any pattern that the road might have, irrespective of size or character.

In some cases one foundry got the small work, and another foundry got the large work, the former being foredoomed by this selling price to a loss, before the patterns were put in the sand. Then contracts began to be written with one price for castings under 10 pounds, and another price for all over 10 pounds. Gradually the weight schedule developed as we now have it, crude at first, but finally working into its present shape, with a multiplicity of schedules for different classes of work. This still is an unsatisfactory way of marketing castings, but at the same time is infinitely better than the old, flat price method. In the development of these schedules to as near a rational basis as such a method can be developed, the Steel Founders' Society undoubtedly has had a leading part, and to its efforts along this line can be ascribed quite largely the improvement in this particular.

Flat Price Inadequate

The flat price method still is used quite extensively and quite unintelligently in quoting to carbuilders on castings for new car construction. Due to the shrewdness of the buyers and the mad desire of the foundries for tonnage, there still are supposedly intelligent manufacturers who are quoting exceedingly low flat prices on castings for lots of cars, irrespective of whether these are made up entirely of heavier castings running from approximately 100 pounds to 250 pounds each, or whether the cars demand in addition an equal or greater number of push pole pockets, ratchets and pawls, or other castings weighing under 25 pounds apiece.

The schedule forms an easy way for buyer and seller to agree on the pricing and checking of prices. While it is a decided improvement on the old flat rate method, it is far from a scientific way of selling a product. There is not necessarily any relation whatsoever between the costs of two castings whose weights are identical. One may be chunky and compact, using simple cores or none at all, easy to mold and easy to clean, with little hazard as to loss and producing a large tonnage per square foot of floor space. The other, of equal weight, and therefore equal selling price, may be of thin section and rangy, taking much larger flasks than the first, requiring the setting of intricate cores, having a comparatively high molding and cleaning cost, subject to excessive cracking, liable to a high percentage of loss, and yielding a comparatively low production per square foot of floor space. There is no reason under the sun for selling these two castings at the same schedule price, except the fact that the individual sellers in the industry as a whole have been too negligent to insist that

Castings Should Be Sold At Cost
Plus A Fair Profit

they be paid in accordance with the worth of the casting, rather than by a rule of thumb.

In many instances it is difficult to suggest a substitute for this method of merchandising, for where a foundry is dealing with a customer on the basis of six months' or a year's arrangement, and his patterns are constantly changing, it is hard to conceive of any other arrangement which will take its place entirely. My only suggestion is that each man operating on a schedule watch this closely, picking out those castings or classes of castings showing costs which are either too high to warrant the price named in the schedule or are too low to justify him in getting it, and then fairly and frankly take the matter up with his customer and ask that these particular castings be put in a separate class with a distinct price.

A steel foundryman who would merchandise his product intelligently, suffers from the fact that the industry grew up with a fundamental misconception, and that so far, through lack of intelligent consideration on the one hand, and the lack of cohesion in the industry on the other, it has been impossible to throw this off. Both buyer and seller, because one ingredient of our product is steel, seem to think that the product ought to be priced on the basis of the number of pounds of steel it contains, and that it is similar to the product of the rolling mills. All of us forget that the production of castings is more in the nature of an art than of a standardized manufacturing process, and that other elements enter into its cost far more than does the metal of which it is composed. We do not buy the various pieces of furniture for our home on the basis of the number of board feet contained, nor do we expect to pay for a fountain pen, a hot water bottle, a garden hose, or an automobile tire on the basis of pounds of rubber.

Metal Small Part

A careful analysis of this company's total manufacturing cost for the last three years shows that the *metal which went into our furnaces, including additions, comprised but* 18.8 *per cent of our total cost;* that our labor, including management, consumed 49.9 per cent of the cost; and that materials other than metal, plus general manufacturing expense, accounted for 31.3 per cent of the cost.

In other words, during the whole of a three-year period, metal accounted for less than 1/5 of our total cost of making castings. These figures will vary somewhat, of course, for other foundries. Nevertheless, it holds for all foundries that instead of selling pounds of metal primarily, we are selling hours of labor, miscellaneous materials, and general expenses. Yet when the metal market starts to drop and we have a decrease of $5 per ton in the cost of pig iron or scrap, our customers generally call for a reduction in excess of this amount, and in the mad scramble for business on a falling market we often find prices dropping $20 a ton because of a decrease of $5 in the price of one of the minor items of our cost.

I realize that this misconception cannot be overturned at once, but it behooves every thoughtful manager to realize that in marketing his castings he is handling something much more complicated than the number of pounds of metal included in them, and to realize that if he would market successfully he must consider the labor and the general expense and overhead involved much more carefully than he does the actual pounds of steel sold.

May I suggest that one of our most cherished traditions may be partly responsible for this false conception.

Most of us have fought consistently for a pound price rather than a piece price. With a good deal of reason, in many cases we have refused absolutely to give a guaranteed weight, which after all is nothing but a piece price, and have insisted that we must be paid a pound price on the full weight of the casting. In doing so we have thought we were protecting ourselves, and have been rather gleeful when we sent out an invoice calling for more pounds than were estimated at the time the order was taken, but I am not at all sure in my own mind that we have not harmed ourselves more often than we have helped.

Why Guess Weights?

Let me illustrate. Some time ago we received an inquiry for two castings from a blue print which showed a rangy and rather complicated design. Our estimating department figured a weight of 7000 pounds, and we quote $10.60 per hundred pounds. In due course of time we learned that the castings were taken at a price of $6.60 per hundred, $4 below the price we had quoted. But, we also learned that our competitor had estimated the weight of these castings at 12,100 pounds each, so that his actual piece price, based on this estimate was $798.60 against our price of $742. Later on we were interested in getting the actual weight of the two castings from the customer, and found that, while we had underestimated, the foundry which had taken the work had overestimated, and that the actual average weight of the two was 10,505 pounds. This at $6.60 per hundred netted the foundry $593.33, or $105.27 under the estimate, that is, under the number of pounds they had figured on multiplied by their price per pound. It did not cost any less to mold this casting at the smaller weight, any less to clean it, the overhead on it was not any less. The reduction in tonnage which brought a reduction in selling price of over $100 was only a saving in steel at approximately 1½ cents per pound, and a saving in freight, a total of perhaps $28, so that the foundry actually received $77 or nearly 10 per cent less for the castings than it had expected. If the foundry had expected 20 per cent profit on this particular job, the error in weight due to the fact that the casting was sold on a pound basis rather than a fixed piece basis, wiped out one-half of the expected returns.

I have cited this example not in any way to criticize the foundry in question, but because it well illustrates the point I have in mind. It is true that if a casting runs over our estimated weight we get a bonus for it at the full pound price, while we have put into it nothing except additional metal. It is also true that if it runs under our estimated weight, the only thing we are saving is the cost of the metal, and it is easy for a comparatively small shrinkage in weight to wipe out a large part of the profit we had in the job. After all is said and done, the only thing in which we really are interested, is a comparatively small part of the selling price, which represents the profit we are entitled to retain. The balance of the price represents money we are handling as a middleman for someone else, getting it from the customer, turning it over in payment for labor, material, etc. I am not at all sure but we could use better business judgment, especially in cases where it is possible to establish fairly accurate weight, to quote by the piece. This would tend to safeguard the profit we have figured, and would have the added advantage of getting both our customer and ourselves away from thinking so much of our product in terms of the *pounds of steel*. However, I am simply throwing the suggestion out for consideration. Consider now some specific problems which affect our every-day contact.

Industrial Managers Owe a Duty To Their Competitors

Miscellaneous steel castings are ordered for one of two purposes: either to take care of repairs and replacements to machinery which has already been built and is in operation, or else as a part of a new machine or piece of equipment about to be built. In neither case, except in rare instances, does the price of the steel casting have anything to do with the quantity ordered. In some industries, such for instance, as the automobile, a decrease in price actually does stimulate sales, because it opens the market to those who at the former price could not possibly have been potential customers. However, in the steel casting industry, no such result follows. As a matter of fact, I believe an examination would show unquestionably that relatively speaking far more steel castings are purchased when the prices are high than when they are comparatively low. Therefore, the policy of pricing our product at or below cost cannot possibly result in permanent advancement. It may succeed temporarily in taking some work away from a competitor, temporarily securing an increase of tonnage, usually however, with a diminution of profit. Soon, however, the situation equalizes itself, and the only result has been to depress the entire market level.

Then, Why Cut Prices?

In a recent letter, the executive head of a company using large quantities of steel castings in a highly competitive industry wrote me:

"We do not care what the price of steel castings is, so long as we are buying them as cheaply as our competitors."

Precisely the same remark was made but a short time ago by the president of one of the large car-building companies.

Figures recently issued by the department of commerce show that for the last 13 years, including the war years, *miscellaneous steel casting plants have operated on a basis of* 63.8 *per cent of their capacity, and that for the seven years since the close of the war they have operated at* 55.1 *per cent of capacity.*

From these figures we may safely make two deductions: That the steel foundry capacity is much in excess of the present demand, and, that the increase in capacity is at least keeping up with the increase in demand.

The knowledge of these facts should have a decided influence on marketing policy. In view of them, I fail to see how any foundry manager, unless he is helped by unusually favorable local conditions, can expect for any considerable length of time to operate his plant at 100 per cent capacity. I can not see how he can argue that if he invests additional capital in an increase in his plant and his facilities, and thereby enlarges his capacity, he can reasonably hope to get the increased tonnage which will compensate him for the expenditure and for increased overhead. He cannot have any assurance that with the industry in its present condition he will be able to get sufficient tonnage so that the increased expenditure will lower his cost, even though it be admitted that such a result could be brought about providing he were able to run the increased capacity at 100 per cent.

If in the light of these facts we are forced to contemplate the necessity of operating over a period of months at from 55 to 75 per cent, then it behooves us not to strive continually

for greater tonnage, but rather to strive to see that the tonnage we have is sold at a figure which will net a reasonable profit on the basis of contemplated operations. Each manager should educate himself, to realize that if he quotes $7.50 on a job which will cost him $6.75, he is really vitally interested only in the top 75 cents, and that if he allows the purchasing agent or his own salesmen to cajole him into cutting the price 50 cents, he has wiped out 2/3 of his profit, while saving the buyer but a meager 6 per cent on his purchase. He must lose no opportunity to impress on his sales force, to iterate and reiterate that the thing in which he is interested is not primarily tonnage, but profit, and that in the scramble of competitive selling he prefers the man who has the nerve and the judgment to let the unprofitable order go to the other fellow.

I already have said that I believe cost estimating in a jobbing foundry is not thoroughly accurate, but the mere fact that the automobile of the present day is not as good a machine as the automobile of five or ten years hence will be, does not appeal to most of us as being a logical reason why we should continue to walk until the perfect machine arrives. The mere fact that our cost systems are not perfect is not any reason why the careful merchandiser should not get everything he possibly can out of the present system.

Watch The Little Ones

Successful merchandising principles would indicate that with an industry running around 60 or 75 per cent of capacity, unusual care should be used in scrutinizing each account to see that so far as possible each order and each pattern bears a price which will yield a legitimate profit on a basis of 60 per cent operation. When business is good you can carry some unprofitable accounts without knowing it, but when business is poor their effect is much more vital. The tighter the race the more necessary it is that each man in the boat pull something besides his own weight. Each account should be scrutinized periodically and carefully to determine as accurately as possible whether it is paying its own way, or whether the foundry is actually paying good dollars for the privilege of having it around.

Every foundry has two extremes in orders, with an infinite variety between these extremes. The lower one is the order which comes in for a single piece, the upper one the order which comes in for generous quantities, sometimes running into the thousands, lending itself to machine production and large shipments, but in many respects the cost on these two orders is the same. Both must go through the same offiice routine, the patterns for both must be made ready, accounts must be opened, bills must be rendered and collected, and both require considerable supervision in getting them started. With the big order these initial charges are of little consequence, but the small order quite generally escapes without bearing its full burden. It costs the ordinary foundry somewhere between $2.50 and $5 to put an order for castings through its books. The wise executive who has any quantity of orders calling for one or two pieces from a pattern will see to it that his prices on such orders protect him on these costs, either by a so-called *cover charge* or by increasing his price on the short orders. Eventually, I believe the schedules used either by a so-called *cover charge* or by foundries must be made with a differential in price between the orders for one and two pieces and those for larger quantities.

Ruinous Prices Are Not Forced By Casting Buyers

I venture to say that the time will come when the practice of charging one customer prices which net a fair profit to the manufacturers, then turning around and giving these profits to some other customers in the shape of prices below cost, will be recognized as both crooked and dishonest, and will be resented as much by fair-minded customers as by anyone else.

The customer who orders in small quantities, the customer who is exceedingly finicky about the character of his work, who expects to receive better than a good commercial grade of product, who requires unusual service in the way of deliveries or of attention, should pay more for his castings than the man who does not expect so much. He will only pay this perfectly justifiable increase in case the merchandiser asks and insists that he do so, for we must remember that our customers are not going to correct our short-sightedness in not asking our cost plus a reasonable profit. He rightly feels that the getting of this is our business and not his.

Because a foundry has a wide range of metal capacity, its management is likely to consider that it can make satisfactorily anything that comes within this range. The foundry accustomed to making small or medium work goes out and takes a job which clearly belongs to the foundry making large castings, only to find that because of the necessity of making equipment or because of the lack of familiarity of its men with the class of work, troubles arise which eat up the estimated profit. The foundry making big work looking with longing eyes on a production job which should go to a specialist in small castings, steps outside of its own field only to find that the skill of the little fellow in this particular line has established a price which nets him a loss.

Stick to Your Last

If we will all realize that *the making of steel castings is something of an art, rather than a straight manufacturing process*, and that therefore, long familiarity with certain classes of work develops a skill and dexterity which does not obtain without considerable practice, and will then exercise a little good judgment irrespective of what our cost estimates may show, we will often save ourselves from taking these unprofitable orders. Often a considerable amount of energy and expense is consumed in getting business outside of our regular field, only to find that it becomes a negative asset.

Compared to other manufacturing lines, the cost of merchandising our product is low, running probably from 2½ to 5 per cent of the selling price. Perhaps this is the reason why it has received so little attention from managers. Like Topsy, most of our sales policies and most of our salesmen *just grow*. We never talk of an apprenticeship course in salesmanship, we seldom give much real training to our salesmen. Too often the foundry salesman's only idea of successful marketing is to find out what is the lowest bid given by any of his competitors, and then try to get permission to beat the record and go lower. Too often he is not at fault in this, because it is all that he has been taught. Too infrequently has he been shown that profit and not tonnage is the main thing desired. Too seldom has he been shown the increase in cost is due to excessive core work, large superficial area, unreasonable delivery, unusual specifications, unsatisfactory and dilapidated pattern equipment. Seldom has his spinal column been inspected to determine whether it contains jelly or backbone. His vocabulary has not been

(*Concluded on Page* 600)

Studies Properties of Cast Pipe

Stresses in Cast Iron Pipe Are Due To Internal Pressures and External Forces — Tests to Determine the Ability of the Pipe To Resist These Strains Are Offered

By Arthur N. Talbot and Frank E. Richart

CAST-IRON pipe generally is used to carry liquids or gases under pressure, and its resistance to pressure or bursting strength is important. Granted the thickness of the pipe is sufficient to sustain external loads that come upon it, either static or impact loads, and that the metal is durable for the conditions of use, the information given by the internal pressure test of a length of pipe on its tensile strength and the nature of the failure is of high value.

The flexure test gives information on the load that may be supported and may give data on the quality of the pipe, especially if flaws or defects develop. An impact test shows resistance to falling loads and to blows received in handling and may bring out properties of the metal in the pipe. The data of the several auxiliary tests well may be studied to learn their value in furnishing information on the quality of metal in the pipe as well as to find what relation exists between these tests and tests of the pipe itself. The pipes are listed by groups and are identified as follows: Group I—Pipe cast vertically in dry sand mold and core. Group II—Centrifugal process in sand mold. Group III—Centrifugal process in water cooled metal mold. Group IV—Pipe cast horizontally in green sand mold and core. Group V—Pipe cast vertically in dry sand mold and core. Group VI—Centrifugal process in sand mold.

In the impact test, the pipe rested on supports 10 feet apart. The energy of the falling hammer disregarding friction, etc., is proportional to the height of drop. It appears that the resistance to the impact of the test varies quite closely as the square of the thickness of the wall of the pipe. During this test the pipe was filled with water under a pressure of 65 pounds per square inch and subjected to blows of the hammer dropped from increasing heights until a crack became apparent through the leakage of water. The hammer weighed 50 pounds and was arranged to strike midspan. A hardened steel bar with the lower edge slightly rounded formed the striking edge of the impact machine.

The first blow was made at a height of 6 inches and the succeeding applications were made with increments of height of 6 inches, the greatest height of drop permitted by the machine being 5 feet. As the hammer was dropped from increasing heights, failure was noted when a leak or spray of water came through the pipe. Usually, an additional blow was applied after the one causing failure. The pipe was broken finally with a sledge and measurements of the thickness of wall made. In the accompanying figure the average height of drop for each lot of pipe has been plotted against average thickness of wall at the cross section at point of failure.

In every case the failure of the pipe became apparent through the formation of a crack that ran longitudinally along the top of the pipe for a length of 1 to 12 inches. Later it was decided to change the distance between supports to 2 feet to permit testing the pipe at several points. Results show that this method is an improvement over the original, but the results of this test are not ready for publication at this time.

Flexure or cross bending test was made by applying a load on the pipe at the middle of a span of 10 feet. The supports were approximately symmetrical with respect to the full length of the pipe. Rocker supports were used, the rocker having a radius of 10 inches and the knife edges, 1¼ inches. The load was applied through a similar knife edge. The pipe always failed suddenly without previous cracking noises or other warning. Generally it was found that when a load gave greatly increased rate of deflection, failure occurred within another 1000 pounds. As a rule the pipe broke straight across, the fraction being clean cut and almost square, and otherwise having the lines within 2 inches of the mean section of break. The average values are given in Table I.

In the internal pressure test, the pipe was placed in a restraining frame, filled with water, and then subjected to internal hydraulic pressure which was increased gradually

Tests Are Interesting

TESTS were made on 25 lots of cast iron pipe made by two sand cast processes and two centrifugal processes and supplied by ten foundries. Comparisons are made of the strengths of the various test specimens with the bursting strengths and flexural strengths. It is found that the strength of the test strip is an index of the strength properties of the pipe. The tests as a whole give useful data on the relation between properties and quality of the pipe and the results obtained from test specimens.

This article was abstracted from a paper read at the annual meeting of the American Society for Testing Materials held at Atlantic City, N. J., from June 21 to 25. The authors, Arthur N. Talbot and Frank E. Richart are connected with the University of Illinois, Urbana, Ill.

Table I

Average Results of Flexure Tests

Group	Number of pipes	Thickness at break, inches	Average maximum load, lbs.	Modulus of rupture lbs. per sq. in.	Mean deviation per cent of average strength
I	27	0.51	15,120	28,100	4.4
II	12	0.45	16,400	36,600	4.7
III	21	0.38	14,870	36,600	7.3
IV	11	0.39	14,260	34,600	6.4
V	8	0.49	16,890	32,600	1.2
VI	9	0.48	18,980	39,100	3.6

MASTER SPECIFICATION FOR HEAVY RUST PREVENTIVE COMPOUND

I. GRADE

Heavy rust-preventive compound shall be of the grade designated as heavy or semi-solid; that is, of the consistency of grease.

II. MATERIAL AND WORKMANSHIP

The manufacturer is given wide latitude in the selection of raw materials and in processes of manufacture, that he may produce a product of the highest quality.

III. GENERAL REQUIREMENTS

Heavy rust-preventive compound must be of such a nature that it can be applied to metal parts by brushing, dipping, or spraying at temperatures not over 71 degrees Cent. (160 degrees Fahr.) to form an adherent protective coating even under the most severe conditions, but which will remain in a nondrying easily removable condition. The material must contain no abrasive substances, must remain homogeneous when heated, must adhere firmly to all metal surfaces, and must remain as a continuous, complete, and protective film at all temperatures at which such surfaces might be exposed under normal conditions in all climates.

IV. DETAIL REQUIREMENTS

1. Melting Point.—Must not be over 55 degrees Cent. (131 degrees Fahr.)
2. Homogeneity.—Must be a homogeneous mixture or compound.
3. Abrasive Substances.—Must be absent.
4. Stability on Heating.—Must remain homogeneous at 71 degrees Cent. (160 degrees Fahr.)
5. Corrosion.—Must show no evidence of corroding steel, brass, copper or aluminum.
6. Adhesion and Protection.—Must pass the "Oven salt-spray rain test." (See v. 2 f).

V. METHODS OF INSPECTION AND TESTING

Deliveries in general, will be sampled and tested by the following methods, but the purchaser reserves the right to use any additional available information to ascertain whether the material meets the specification.

1. Sampling.—It mutually is agreed by buyer and seller that a single package out of each lot of not more than 1000 packages shall be taken as representative of the whole. Whenever possible an original unopened container shall be sent to the laboratory, and when for any reason this is not done the inspector shall mix thoroughly the contents of the container sampled, transfer not less than 1 quart to a clean, dry glass jar or tin can, which nearly must be filled with the sample, securely stoppered with a new, clean cork or well-fitting cover or cap, sealed, and labled distinctly by the inspector. The inspector should take a duplicate from the container sampled to be held for check in case of dispute, and, when requested, should take a sample for the seller.

Abstracted from United States government master specification No. 239.

(*Continued on Data Sheet No. 632*)

MASTER SPECIFICATION FOR HEAVY RUST PREVENTIVE COMPOUND

(*Continued from Data Sheet No. 631*)

2. Laboratory Examination.—Except where otherwise stated in the following directions, the tests shall be made in a room at ordinary temperature, not below 15.5 degrees Cent. (60 degrees Fahr.), and free from laboratory or other corrosive fumes.

(*a*) Melting point.—Determine by the method used for petrolatum, federal specifications board specification No. 2c (bureau of mines technical paper 323A), method 40.3.

(*b*) Homogeneity.—Portions shall be taken from the top, bottom, and intermediate parts of the sample and examined visually to determine whether there is any apparent difference in appearance or consistency.

(*c*) Abrasive substance.—Heat 50 g. of the sample with 100 cc. of benzol (C_6H_6) on the steam bath to about 75 degrees Cent. (167 degrees Fahr.) and stir until all soluble matter is in solution. While still hot, filter through a clean, dry filter paper. If any residue remains on the paper wash with 25 cc. of benzol, transfer a portion of the residue to a clean piece of polished glass and rub vigorously with a clean finger. Wash the residue from the glass, dry, and examine the dry clean glass. Scratches produced on the glass by this treatment indicate the presence of abrasive substances.

(*d*) Stability on heating.—Transfer about 25 g. of the sample to a test tube about 13 mm. in diameter and 250 mm. long (½-inch by 10 inches), heat in a water bath maintained at 70 to 72 degrees Cent. (158 to 162 degrees Fahr.) for one hour. Remove from the bath and examine while hot and after cooling for any visible separation into layers of different appearance or separation of solid or liquid matter at the bottom of the tube.

(*e*) Corrosion.—Clean, well-polished sheets of steel, brass, copper, and aluminum shall be used for this test. In general, pieces about 25 mm. (1 inch) square will be found most convenient. Place a small portion of the material to be tested on each of the metal plates taking care not to cover the whole surface. Cover each plate with an inverted watch glass and let stand for five days. There must be no evidence of corrosion on any of the metal plates, either when examined with the sample in place or after removing it by washing with benzol. While it is important to apply this test with all the metals mentioned it generally will be found that the test with copper is most valuable. Either the development of a green color in the material on the copper or a stain remaining on the copper after washing with benzol, is evidence of corrosion.

(*Concluded on Data Sheet No. 633*)

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in notebook form.

THE FOUNDRY DATA SHEET, AUG. 1, 1926
Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Around the World with The Foundry

Little Journeys to the homes of our readers

Trinidad

DAVY JONES' Locker long ago has swallowed them all, Drake's and Flint's and Morgan's men, who left Plymouth Hoe and with visions of golden treasure and high adventure, sailed Westward Ho! when the new world isles were young. With the old flag flying, these swashbuckling bravos drove their crafts until the three mountain peaks in a row, rising out of the sea indicated that they were approaching the island off the mouth of the mighty Orinoco. Black murder and rapine on the high seas and flaming towns ashore marked their future activities until, weighted down with looted treasure, the survivors beat their way back across the Atlantic and either lived lives of ease, or, were hanged upon Execution Dock, depending on whether or not they had exercised due discrimination in selecting their victims.

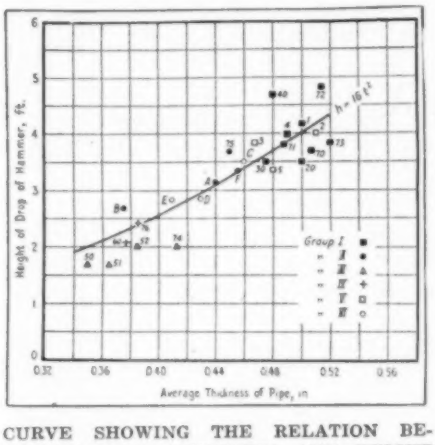
Today, old, serene and beautiful, Port of Spain in Trinidad, drowses over the memory of its riotous youth when it was the rendezvous of every ear-ringed, red-capped buccaneer in jack boots and cutlass who sailed the Spanish Main. Today it is the principal shipping point for equatorial South America and is in direct steamer communication with some of the leading ports of the world. Steamer terminals require repair shops and repair shops require castings and the principal foundry proprietor in Port of Spain keeps abreast of the times through the columns of the twice a month FOUNDRY.

"Wherever metals are cast you'll find THE FOUNDRY"

until failure occurred by the fracture of the pipe. A special cast iron plug was caulked in the bell end of the pipe and a special cast-iron cap was fitted to the spigot end. Great care was required in forming the lead joints between the pipe, plug and cap to withstand the high pressures of the test. The arrangement of the pipe in the restraining frame was such that the pipe was free to shorten with circumferential expansion.

Failure was always sudden. It is worth noting that the fracture of every pipe occurred at the part of the circumference and the portion of length that had the least thickness of wall. The pipe generally failed by the formation of a longitudinal crack which opened only slightly. Average results of internal pressure test are given in Table II.

The flexure test, impact test and internal pressure test have merit in



CURVE SHOWING THE RELATION BETWEEN WALL THICKNESS AND HEIGHT OF DROP IN IMPACT TEST

giving information on the strength properties of cast iron pipe. It is believed that an impact test can be devised that will be helpful in obtaining the minimum thickness allowable in pipe made by a given method of manufacture and useful in determining quality of metal and degree of uniformity. The internal pressure test is a most searching test—the ordinary proof pressure test gives relatively little information—and measurements of thickness of the broken pipe and auxiliary test specimens taken from it for use in determining strength and stiffness qualities also will give important information in judging of quality of output. The auxiliary test specimens also may be taken from a pipe that has been tested in other ways or even may be cut from a pipe rejected because of a defect or imperfections that leaves most of its length free from such imperfections. Of these auxiliary test specimens, the test strip has advantages over others. It can be cut cheaply and quickly reduced to exact dimensions throughout the length and without danger of breakage by a double milling cutter, the method used in this investigation. The beam depth of this test strip is uniformly ½-inch and the width covers the full thickness of the wall of the pipe and thus the fibers across the width of the beam at any depth are stressed equally. The results may be taken as representative of the wall material. The two point loading gives high stress over a greater length than would a load at midspan and thus is more searching. The relations of the strength properties of this specimen to the internal pressure strength and the flexural strength of the pipe are fairly uniform for most of the lots of pipe tested, and a ratio between modulus of rupture of test strip and internal pressure strength and flexural strength of full sized pipe may be established which with suitable tolerances may be put into specifications. The requirements for stiffness quality also may be specified through the modulus of elasticity of the test strip. In all these ways the test strip has qualities that make it a useful auxiliary test specimen. Some average results of these test strips are given in Table III and chemical analyses in Table IV.

No attempt has been made to outline requirements for pipe of any group; nor has any effort been made to bring out what tests and inspection should be undertaken to detect variations and lack of uniformity in thickness and the presence of flaws, defects and unsatisfactory material in pipes that have not been subjected to the tests outlined, or to avoid improper practices in manufacture. Instead, the relations between various tests have been considered.

Table II

Average Results of Internal Pressure Tests

Group	Number of pipes	Thickness at break, inches	Bursting pressure lbs. per sq. in.	Bursting strength lbs. per sq. in.	Mean Deviation per cent of average strength
I	27	0.49	2150	14,700	7.4
II	14	0.41	2810	20,300	4.4
III	22	0.36	2850	24,000	7.3
IV	11	0.35	2050	18,200	15.0
V	9	0.43	2070	14,000	8.3
VI	9	0.38	2840	22,500	5.3

Table III

Average Tests of Auxiliary Specimens

Group	Test bar modulus of rupture lb. per sq. in.	Test strip modulus of rupture lb. per sq. in.	—Tension test— Specimen No. 1 lb. per sq. in.	Specimen No. 2 lb. per sq. in.	Ring modulus of rupture lb. per sq. in.
I	39,100	34,400	21,700	23,000	41,100
II	42,400	43,100	26,500	27,600	46,800
III	.....	48,600	34,400	34,800	47,000
IV	.....	41,400	30,600	34,000	46,000
V	41,800	40,300	24,400	26,400	45,700
VI	44,800	42,500	29,900	31,200	52,500

Honor Medal Recipients

In recognition of the achievements of two of its associates, Aldus C. Higgins and Charles H. Norton, whose inventions made them recipients of the John Scott medals, the Norton Co., Worcester, Mass., has published a book giving brief details of each invention. Mr. Higgins was awarded a medal on March 13, 1914 for his electric furnace in which alundum is made commercially, and Mr. Norton was awarded a medal on June 17, 1925 for his work on grinding machines.

Table IV

Average Analyses of Pipe and Test Bars

Group	Silicon per cent	Sulphur per cent	Phosphorus per cent	Manganese per cent	Graphite per cent	Combined per cent	Total per cent
I	1.52	0.076	0.43	0.70	2.84	0.74	3.58
II	1.42	0.066	0.31	0.75	2.75	0.81	3.56
III	1.84	0.054	0.36	0.81	3.45	0.09	3.54
IV	1.65	0.071	0.30	0.80	2.85	0.68	3.53
V	1.64	0.057	0.43	0.79	2.76	0.71	3.47
VI	1.72	0.070	0.37	0.72	2.62	0.71	3.33

Large Tonnage Handled With Ease and Speed

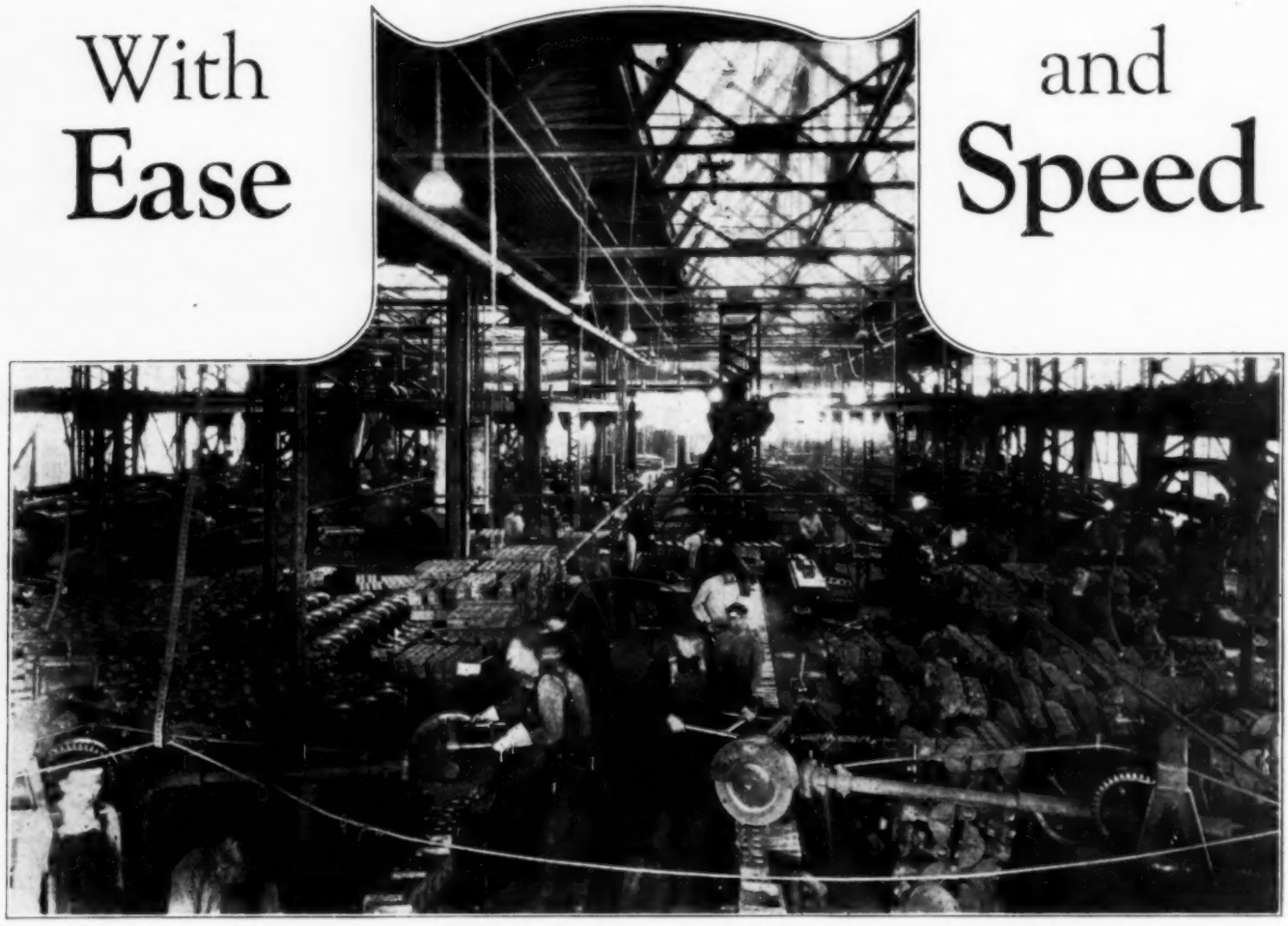


FIG. 1—A STEADY STREAM OF CASTINGS PASSES UNDER THE SWING GRINDERS

By Pat Dwyer

DIRECTNESS and simplicity characterize the main plan of operation in the Central Foundry, Saginaw Products Co., Saginaw, Mich., as was mentioned in the previous articles on this remarkable establishment, appearing in THE FOUNDRY, June 1 and 15. The same directness and simplicity are shown in every division and subdivision of the main plan. Uniformity of iron mixture is secured by confining the raw material to four classes, malleable pig iron, ordinary No. 2 foundry pig iron, steel scrap and domestic scrap. The silicon content is adjusted by the addition of small quantities of 17 per cent ferrosilicon to the charges in the cupola. Low total carbon and low silicon are secured through the steel scrap and the malleable pig iron. The analysis of the domestic scrap is known and since this scrap amounts to approximately 30 per cent of the total amount charged each day, provision must be made for its absorption day by day.

Iron for cylinders must conform to close specifications not only theoretically but in actual practice. Castings from each heat are marked with a serial number for purpose of identification. At the point of assembly one or two castings from each day's heat are subjected to a series of chemical and physical tests and if more than three fail to meet these tests satisfactorily, the whole batch is condemned without further ceremony or chance of appeal.

Owing to the working of what is best known perhaps of all foundry laws, the thin flanges and walls of the crankcase cool much more quickly than the walls of the various barrels and as a result a considerable variation exists in the hardness of these two parts of the casting. A hard surface is required in the barrel to prevent wear, but if an iron mixture to produce a hard barrel is used, that is hard up to the point where machining trouble begins, the other parts of the casting will be so hard that they cannot be machined at all. Therefore, the problem continually confronting the foundryman is to produce a mixture that will show a maximum hardness in the barrels and still be machinable in the thin exterior parts of the casting. To maintain this delicate balance requires the most constant and expert care and supervision and at times the exercise of a species of intuition or sixth sense common to every trade and profession and which is developed unconsciously over a long period of intense application to the solution of problems incident to any industry.

Iron charges for the cylinders are made up to meet an anticipated analysis as follows: Silicon 2.30 per cent, sulphur under 0.10 per cent, phosphorus 0.20 per cent, manganese 0.70 per cent.

On the other castings, cylinder heads, pistons and gear casings where the peculiar and contradictory conditions necessary in the cylinder castings

FIG. 2—WIRE SCREENS AT THE VARIOUS GRINDING AND CHIP PING STATIONS PREVENT DUST, SPARKS AND CHIPS OF METAL FROM FLYING AROU ND PROMISCUOUSLY

do not obtain, a little more latitude is allowed in the iron mixture which is considerably softer than the cylinder iron. Under present conditions two cupolas melt all the iron for the cylinder castings, while iron for the other castings is melted in the two remaining cupolas. Of course, other combinations are possible and are practiced as occasion and the volume of castings of any particular type demand.

Making Up the Charges

When the foundry was built in 1919 two charging floors were provided, one 12 feet above the other, to prevent congestion in handling 200-ton heats. Pig iron and steel scrap, coke and limestone were assembled, weighed and charged into the cupolas from the lower or main charging floor. Shop scrap was carried to the upper floor and charged into the cupolas from that point. The same routine still is followed although the tonnage handled now is nearer 600 than 200 tons. Just as an example of what may be accomplished in an emergency, the total amount of material used in the heat has been charged from the lower floor on several occasions when the elevator serving the upper floor has been out of commission.

The main charging floor, made of heavy steel plate attached to steel beams by countersunk rivets and calculated to support 2000 pounds to the square foot, is open on the side facing the stock yard. A space 15 feet wide is left clear in front of the battery of cupolas and the remainder of the floor space is divided into a number of compartments or bins separated by steel plates 4 feet high. A 10-ton bridge crane with a 70-foot span and equipped with a magnet, lifts the material from the stock yard and deposits it in the various bins on the charging floor. About 100 tons of material is placed on the charging floor at night and the remainder is lifted during the day. Even then the crane is not pushed to capacity. Between times it is employed to unload cars of pig iron and scrap and pile the material in the stock yard.

Hand propelled trucks are loaded from the bins and weighed on either one of two platform scales on the way to the cupola. Each scale is equipped with several beams on which the proper weight for each ingredient of the charge is set by the metallurgist before the men commence making up the charges. Each buggy holds three fourths of a complete 3000-pound charge made up approximately of 50 per cent pig iron, 10 per cent return scrap and 15 per cent steel scrap. The remainder of the charge

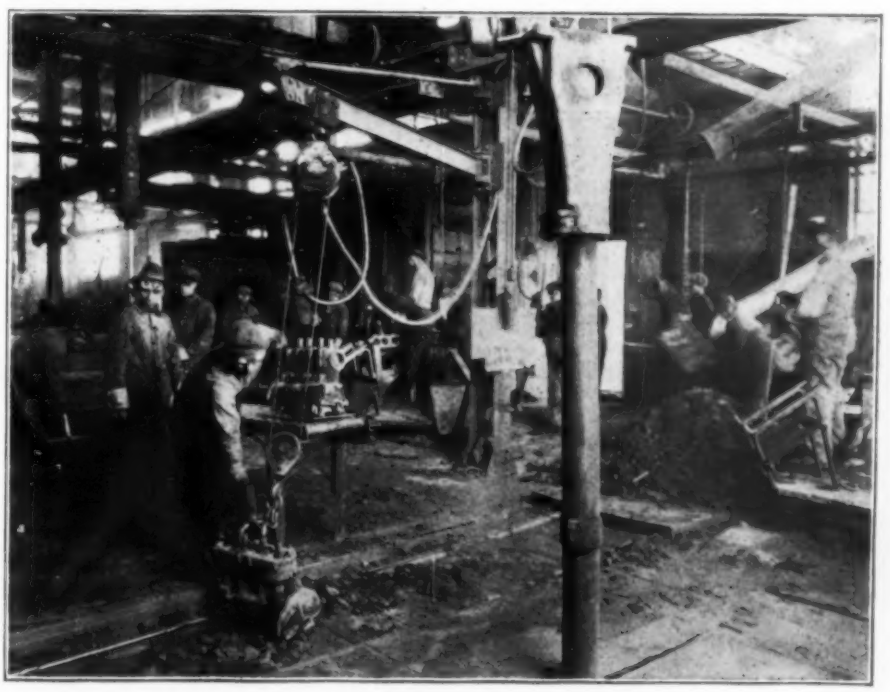


FIG. 3—AN UNDERGROUND CONVEYOR BRINGS THE CYLINDER CASTINGS INTO THE NORTH END OF THE PRELIMINARY CLEANING ROOM WHERE THEY ARE LIFTED ONTO A REVOLVING STAND TO HAVE THE CORES KNOCKED OUT

FIG. 4—CASTINGS ARE LIFTED FROM THE TRUCK TO THE REVOLVING STAND SHOWN NEAR THE CENTER, THEN TO THE SANDBLAST CHAMBERS TO THE RIGHT AND THENCE TO THE MAIN CLEANING ROOM

is added through the upper doors. The buggy is placed on the scale and the pig iron is loaded until the first beam tips to show the amount is complete. Then the shop scrap is added until its beam tips. The correct weight of steel scrap is indicated in a similar manner and without taxing the intelligence of the charging crew. They are told to load the buggy from bins 1, 2 and 3 until beams 1, 2 and 3 on the scale drop. They are neither asked nor expected to figure weights or mixtures. They are given a simple elementary job to do and they do it. With this system of loading, the steel is on top and is thrown first into the cupola following the coke.

Three men charge the pig iron, scrap, coke and limestone into each cupola from the main charging floor. Two men on the upper floor attend all four cupolas and add the necessary 30 per cent or 900 pounds of shop scrap to each charge. The cupolas melt at the rate of 18 tons per hour with a coke consumption of 1 to 8. On account of the facilities provided and the short distances the materials have to be conveyed, the men experience no particular trouble in keeping the cupolas filled to the charging door until the entire amount has been charged each day.

With the single exception of the coreroom where a considerable part of the work is light and within the capacity of female labor, all the operations in this plant call for the services of strong, active young men who can set a swift pace and keep it up all day without intermission. Colored men on the charging floor are specially selected for their physical fitness and in their semi-nude state present an inspiring spectacle to any person fortunate enough to possess what undoubtedly is a primeval heritage, admiration for symmetry, grace, posture and line presented by the ideal, adult male figure. With the exception of the Ethiopean features and the color of the skin any one of these men might serve for a model for the athletes and fighting men immortalized by the sculptors of all ages.

FIG. 5—ONE OF THE CONVEYORS SERVING A ROW OF STATIONARY GRINDING WHEELS AND CHIPPING BENCHES CLOSE TO ONE SIDE OF THE BUILDING

Four 90-inch cupola shells lined down to 74 inches at the bosh and 66 inches at the tuyeres are used for melting the iron required in the main foundry. A smaller cupola with a 56-inch shell lined to 40 inches is provided for melting occasional special heats in a miscellaneous casting department erected close to the cupola department and at right angles to the main building near the northeast corner.

Ample Blowing Capacity

Air is furnished by three positive pressure blowers made by the P. H. & F. M. Roots Co., Connersville, Ind., running at 175 revolutions per minute and delivering 8300 cubic feet of air in the same period of time. The three blowers discharge into a 36-inch header which supplies a 26-inch pipe leading to each of the large cupolas and a 10-inch line connected to the small cupola. Blast gates operated through a rack and pinion and controlled from the floor through a short chain are attached to each blast pipe.

Small cars mounted on a narrow gage industrial track with a spur extending close to the back under each furnace are used for hauling the slag and other refuse from the cupolas to the dump. A bin for holding the clay used for daubing the cupolas and ladles is located back of the cupolas and under a roof formed by the mezzanine floor supporting the blowers. The ladles are dried in an oven located in the opposite corner of the same room. Before leaving the cupolas it may be interesting to note that the main charging platform is 24 feet above the ground level and the spark arrester with which each cupola is crowned is 67 feet above the foundry floor. The concrete foundation for each cupola is 11 feet square and 6 feet deep. When fully charged it is claimed that each cupola weighs 130 tons.

Method of distributing the metal and pouring the molds was described in the second article of the present

series which appeared in THE FOUNDRY, June 15. Reference also was made to the present system of conveyors and trucks by which the castings are taken from the various shakeout stations to the preliminary cleaning room extending all the way across the foundry building at the opposite end from the cupolas. At the time this is written the C. O. Bartlett & Snow Co., Cleveland is engaged in the construction and erection of a new overhead conveyor in which the castings suspended from hooks will travel slowly in a number of long curves through the open air for nearly an hour in the passage from the shakeout to the cleaning room. By that time they will have cooled to a temperature at which they may be handled readily and a great deal of discomfort due to handling almost red hot castings will be avoided. One underground conveyor is in use at present serving two molding units, but all the castings made on the remaining units are loaded in trucks at the shakeout stations and taken to the cleaning room. They are left outside the building as long as possible, but on account of being piled together in large numbers they hold the heat for a long time.

Preliminary Cleaning

Following the general plan of simplicity of operation and division of the work among many men the castings pass through two cleaning stages. In the first rough cleaning, most of the adhering sand is knocked from the outside and practically all the core sand is knocked out of the inside. The castings then are conveyed to the second cleaning room on trailers attached to electrically operated trucks. One overhead conveyor, illustrated in the first of the present series, is used to convey cylinder blocks from one cleaning room to the other and others are in contemplation. The castings are suspended from hooks that may be engaged and disengaged easily. In the second cleaning room the castings first are tumbled in a battery of 36 barrels made by the W. W. Sly Mfg. Co., Cleveland and afterward, chipped, ground, inspected, tested and shipped from a loading dock on the west side of the building.

Two views of the preliminary cleaning room 40 x 164 feet 4 inches are shown in Figs. 3 and 4. One shows the end of the underground conveyor which brings the Chevrolet cylinder blocks from the shakeout station to the north end of the cleaning room. The other view is taken from a point about half way through the building looking toward the south end. This second view was taken on a day when

FIG. 6—TUMBLING BARRELS ARE ARRANGED TO BE DRIVEN IN GROUPS OF 12 FROM A SINGLE MOTOR, BUT EACH BARREL MAY BE STARTED AND STOPPED INDIVIDUALLY. AIR HOISTS AND CONVEYORS FACILITATED LOADING AND UNLOADING THE BARRELS

the stream of castings temporarily had ceased to flow through. In common with every other department of the plant this cleaning room is lighted principally through a glass roof. Ample windows in the west side and at both ends admit additional light and air. The wall at the east side separating the cleaning room from the foundry is blank with the exception of four doorways, one facing each of the main gangways in the foundry.

Cylinder castings are snatched by a small air hoist from the conveyor as shown in Fig. 3 or from the truck shown in Fig. 4 and placed upon a revolving platform provided with four upright frames. Three men attend each platform. One man loads and unloads the frames and the remaining two rap the castings with sledge hammers to remove the sand inside and outside. In the installation shown in Fig. 3 the cleaned castings are attached to hooks suspended from a conveyor chain which travels through a sandblast chamber shown at the back of the illustration. After passing through the sandblast chamber the castings are hooked to a second chain which carries them into the main cleaning room where they are prepared for shipment.

The remainder of the castings brought into the cleaning room on trucks are placed first on the revolving stands where the loose sand is removed, then into one of two re-

FIG. 7—FROM A PICTURE MADE IN 1919 BEFORE THE FOUNDRY WAS PLACED IN PRODUCTION AND AT A TIME WHEN THE DAILY HEAT WAS NOT EXPECTED TO EXCEED 200 TONS

volving table type sandblast cabinets made by the W. W. Sly Mfg. Co., Cleveland. Afterward they are reloaded in trucks and taken across a roadway into the main cleaning room where they arrive in a condition too hot to be touched with the naked hands. The cleaning room runs on a double shift and in that way keeps ahead of the avalanche of castings that pour out of the foundry and threaten to swamp the cleaning room at the close of each working day.

Approximately 2000 cylinders a day pass through each of the three knockout units in the preliminary cleaning room. This works out at 250 per hour or roughly 4 per minute. From this it is apparent that the men engaged in this rough work practice a technique fully up to th stand-e ard set by the men on the charging platform and by the men who make the molds and pour them. To ameliorate unpleasant conditions as far as possible, the men in the cleaning room are provided with gloves and goggles while the men at the shakeout station where the smoke is thickest are equipped in addition with gas masks and respirators. Colored men are employed exclusively on this work which is fairly hot in the summer, but which is just warm and comfortable in the winter. The foundry is heated by steam in radiators and by hot air driven through steam coils, but a little extra heat is appreciated in upper Michigan where the winters are longer and more severe than in many more favored sections of the country.

Several men are kept employed constantly in shoveling all the sand knocked off and out of the castings, through several gratings in the floor provided for the purposes. The sand falls on to a 30-inch belt which carries it outside the building to a pit where it is mixed with water and then pumped through a long 5-inch pipe to the dump as explained in the preceding number of this series.

Castings receive a first inspection on leaving the preliminary cleaning room, and automatically fall into three classifications. Those that are apparently O. K. are taken to the main cleaning room. Those that are plainly defective are stacked with the scrap and trucked to the stockyard. The third and smallest class, usually amounting to less than half of one per cent includes all those presenting minor surface defects. These are taken to a small room adjoining the first cleaning room where they are heated to a bright red color in oil fired furnaces and then the defective areas are repaired with an oxyacetylene torch. The castings afterward are cooled slowly and then taken to the main cleaning room.

FIG. 8—INGENUITY DISPLAYED IN DEVELOPING SHORTCUT METHODS HAS BEEN EXTENDED TO MAKING CHANGES IN STANDARD EQUIPMENT TO MEET LOCAL CONDITIONS MORE EFFICIENTLY

Several interesting features in the main cleaning room are shown in the accompanying illustrations including one Fig. 7 made from a picture taken in 1919 shortly before the foundry actually was placed in production. The only equipment in place at that time was a battery of 36 tumbling barrels previously mentioned. This same battery still is in use, but it has been supplemented by stationary and swing grinders and by roller conveyors that transport castings easily and rapidly from one given point to another. Small air hoists facilitate loading and unloading of the tumbling barrels and an adequate exhaust system maintains clean and sanitary atmospheric conditions in the vicinity.

Men, machines and other equipment are arranged in such a manner that the castings pass steadily in one direction from their entrance through several doors on one side of the building to their exit on the loading dock on the opposite side.

This is the third of a series of four articles dealing with the methods pursued at the Central Foundry, Saginaw Products Co., Saginaw, Mich. The second, which appeared June 15, showed methods and equipment. The fourth and concluding article will appear in an early issue.

Are You Playing Fair?

(*Concluded from Page* 593)

examined to see whether it contains the word *no*. He has not been trained politely, intelligently, but at the same time vigorously, to defend his product and his prices when attacked by an aggressive buyer.

The problem of merchandising steel castings at a profit is strictly up to the steel casting industry. Prices that would ruin us are not named by purchasing agents, but they are named by ourselves. The conditions of which we complain are our own making, they have not been forced upon us by outside industries. They will continue only so long as we, because of our stupidity, our indolence, or dishonesty to one another, permit them to do so. Individually and collectively, we have the solution absolutely in our hands. I firmly believe that if any one will resolve that his own organization will take no work which he does not honestly believe will yield a profit, he will find at the end of the year that he is better off than by chasing tonnage. I am absolutely certain that if every manager who reads this paper will firmly resolve that he will take no orders unless a careful and honest estimate, made in the light of the best information he has, indicates that that order will yield cost plus at least a small profit, and that he will deal fairly, squarely and honestly with his competitors, even as he expects them to deal with him, the question of the proper marketing of our commodity will have been solved.

Publish New Catalog

Patternmakers hand tools are the subject of a new catalog recently issued by the Wellman Products Co., Cleveland. The catalog is illustrated by half tones and zinc etchings of the various tools listed. The sizes and prices also are given.

Canadian Foundry Makes Large Hydraulic Runner

Fig. 1—The Hydraulic Runner Has 19 Blades, is 4 Feet in diameter and 3 Feet High and Weighs 4500 Pounds

ADVANCES in various Canadian hydraulic projects in recent years have developed a demand for larger units which must run at high speeds and at the same time show greater resistance to wear. One of the largest castings of this type ever poured in Canada, namely a large hydraulic runner, recently was completed at the plant of the National Bronze Co. Ltd., Montreal, for the Canadian Allis-Chalmers Ltd., Quebec, Canada.

This large runner, which is shown in Figs. 1 and 2, is 4 feet in diameter and 3 feet high. The casting has 19 blades and weighs 4500 pounds, and was designed to have a strength of 60,000 pounds per square inch as a minimum. An elongation of 20 per cent also was desired to allow the casting to withstand shock without fracture. The casting was made of special manganese bronze made by the National Bronze Co., and was melted and poured under scientific supervision. Test bars from the metal, from which the casting was poured, gave a strength of 70,125 pounds per square inch, or 10,125 pounds per square inch greater than the minimum required. The strength of the bronze is due to the shrinkage factor, and this is a problem when making such a casting. In this instance the casting was free from shrinkage cracks and uniformly sound.

Several interesting features are noted in making the mold for this casting. The 19 cores, which may be noted in Fig. 3, were made of Albany sand bonded with dry core compound and wet with clay wash. These cores were made at the side of the pit on steel plates and were transferred carefully to the drying oven, which in this case was fired with city gas. The dried cores were taken to the pit, placed on the bottom plate, which was split, and there assembled. Six cores, which formed the bottom ring, were placed outside of the 19 cores forming the blades. The space surrounding the

(*Concluded on Page* 610)

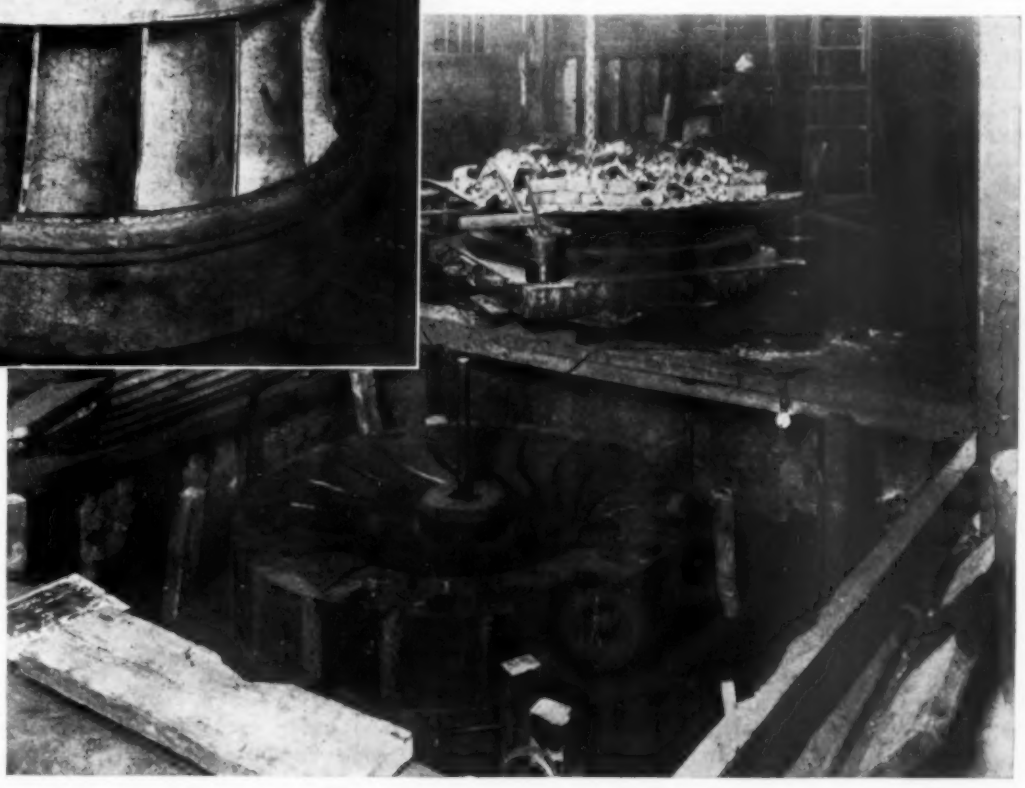


Fig. 2 (Above)—A Side and Top View of the Completed Casting. Fig. 3 (Right) Cores Were Used To Make the Blades for the Runner

How and Why in Brass Founding

By Charles Vickers

Bronze Fails To Flow

We have on hand a lot of broken manganese bronze propellers, they are surface wheels used on speed boats, and we want to use this scrap up in re-casting the propellers. The trouble we find is to get a perfect wheel on the outer edge of blade, where it is about one-eighth inch thick, as we have not so far been able to get the metal hot enough to fill out the mold.

The castings are poured from the hub of the wheel and the metal appears hot on being taken from the furnace, but cools very quickly on being withdrawn. The wheel is 34 inches diameter. Is it possible to use such metal for such work, melting in an old fashioned coke-fired pit furnace?

We are at a loss to understand why the manganese bronze fails to flow and fill the mold, as this metal is of a fluid nature owing to its content of aluminum. In the absence of a knowledge of the analysis of the scrap we are unable to suggest any additions to the metal, likely to correct the defect.

The method of pouring from the hub largely is practiced, but the bronze is seldom dropped into the hub, as this makes much dross due to the lathering produced by agitation of the molten metal. Always remember the action of aluminum in yellow brass (which is what manganese bronze really is) is to confer frothing properties on the alloy, so that it resembles soapy water and other frothing liquids. For this reason the safest manner of gating manganese bronze castings is from the bottom. Therefore, if the propeller castings are gated from the hub, the gate should be connected to the bottom of the hub, and a large riser or sink head is put on top.

In some cases propellers are gated on the blades. When of the size mentioned in the query it is not uncommon to see them so gated. This method might be tried, but no matter where gated if the outer edge of the blades is very thin, it is advisable to sew through the mold on the thin sections with a vent wire, about the size of a common knitting needle. In other words the thin section should be thoroughly vented through the cope by pushing a straight vent wire entirely through; this will ensure the escape of air and prevent its compression to the density at which it holds back the flow of the metal.

The old-fashioned pit furnace fired with coke will melt this alloy, but it is necessary to get manganese bronze hot in the furnace to avoid yellow and brown specks in the fractures. Let the zinc flare, and do not be afraid of losing a little as it is cheaper than making poor castings. It looks as though the alloy has not been given proper heat in the furnace. It is not necessary to pour at the temperature it comes from the furnace. In fact, the tensile strength of properly made manganese bronze can be gaged quite accurately from a knowledge of the amount of cooling metal added to the heat before it can be poured. The scrap ought to be good and satisfactory metal. If it was good originally, an analysis would furnish this information.

Encounters Difficulties

We have experienced difficulties in making motor slip rings. The castings appear clean but when machined, pin holes appear. We are using the following mixtures; (1) *Copper* 88.5 *per cent; tin* 5.5 *per cent; zinc* 3.5 *per cent; lead* 2.5 *per cent.* (2) *Copper* 94 *per cent; tin* 4 *per cent; zinc* 1 *per cent; lead* 1 *per cent. Every precaution possible is taken while melting the alloys, charcoal and proprietary fluxes being used, and we pour with horn gates so it is not possible for dirt to come from the molds. Therefore, we feel it must originate in the metal, and we shall be pleased to have you suggest a remedy, and also a more suitable mixture if that is possible.*

No matter how perfect and pretty a mold may look before it is closed, it is possible to find the casting defective, through no fault in the metal, but because there was something wrong with the mold itself. The use of horn gates does not insure the castings being clean either. In fact it is generally the opposite, because a horn gate as generally used forms a nozzle through which the metal is squirted with force and quite frequently it hits a wall of green sand and rebounds back. This is a good way to producing dirt by pecking off *little grains of sand*, or going further a scab may result. To get a perfect casting, one without a speck in it when it is turned and finished, the molten metal must lie quietly against all mold surfaces. The gas and steam produced in the mold by the action of heat on water and organic matter, must not have to escape through the metal. If the sand used to make a mold is too damp, too solidly packed, or not sufficiently porous because of too fine or clayey a grade, then the gas generated will in part pass through, or into the metal causing the later to dance or simmer—and trap some of the air, which later is found as holes in the castings. We suggest that nothing be taken for granted about the mold, check up the grade of sand, its moisture content, and the density to which it is rammed. Try gating the rings from inside, using gates that are tortuous and do not run the metal straight into the casting, dirt and all. A lot of study can be given to the gates for any kind of a bronze ring.

As to the metal, have it clean, and clean means free of iron. When pulled from the furnace it should be hot, and the zinc should flare. When skimmed, there must be no dark colored blisters rise to its surface. Iron in red metal is a wonderful trouble maker. If clean and perfect castings are wanted, keep it out by using all virgin metals, and keeping away iron bars, also fluxes unless their analysis is known. As far as the alloys being used are concerned the first alloy ought to be good. The second might need a little deoxidizing to insure perfect soundness. The zinc might be increased to 3½ per cent, or one ounce and a half of phosphor copper, per hundred pounds of brass might be added.

Alloy Resists Corrosion

We understand that aluminum alloy castings used on marine motors must stand salt water. Kindly advise what mixture you recommend.

An alloy of pure aluminum 87 per cent, silicon 13 per cent is frequently used to resist corrosion. An alloy used by the Navy department on submarines follows: Aluminum, 96.5 per cent; copper, 2 per cent; manganese, 1.5 per cent.

Skip Hoist Charges Cupola

Metal Melted Daily Has Been Increased from 110 to 160 Tons and the Number of Men Required to Handle It Has Been Reduced from 11 to 5

By J. J. Boland

WITH comparatively few exceptions foundrymen have held and still hold to the opinion that a cupola must be charged by hand to insure uniform melting conditions. Cost of labor is not an important factor in the operation of small cupolas. Charging 125 to 200 tons a day into a cupola with a 90 to 100-inch shell diameter is not only a laborious task but is an expensive feature where the work is done by a gang of laborers.

During the war period the Griffin Wheel Co., Chicago, made many changes and improvements in the equipment and methods connected with the cupolas in its various plants. In Kansas City, Kans., and in Council Bluffs, Iowa, a gantry crane in the yard and an overhead bridge crane and charging boxes were used to charge the cupola. Many details worked out in these installations indicated that a skip hoist might be used successfully.

The upper part of the cupola stack which had a large opening cut in it to permit entrance of the charging cars was supported independently of the body. The charging cars could be racked in or out and in this manner the charge could be deposited uniformly in the cupola.

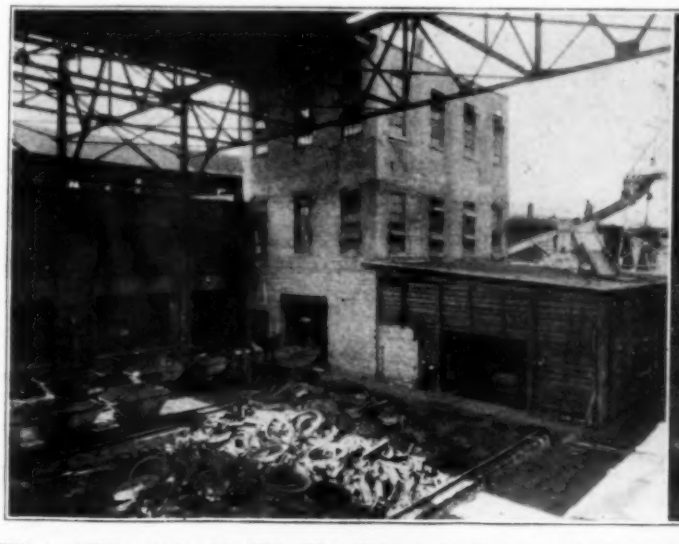
A combination of features from several mechanical charging devices and shown in the accompanying illustration Fig. 4 was installed early in 1925 at the Detroit plant of the company. The skip bucket has been replaced by charging cars which are

FIG. 2—ABOVE, TRANSFER CAR AND TRACK ARRANGEMENT AT THE FOOT OF THE SKIP HOIST

pushed on to the platform of the hoist and locked in place. Built of structural steel well braced, the hoist is somewhat similar to an inclined elevator. The angle of incline sets the base sufficiently far away to provide working space around the cupola. The platform is equipped with four flanged rollers mounted on two through axles which are guided by rails to the top of the device. The guide rails are curved and so arranged that the charge is distributed uniformly across the cupola which is necessary to maintain a constant analysis of the molten iron.

Charges are made up in the yard by a gantry crane. A transfer car is employed to shift the iron and coke cars to the various storage points and thence to a point in front of the skip platform. The charging cars are pushed by hand on to the platform and then locked in place. The skip then is hoisted and tilted to discharge the load into the cupola. The skip platform with the empty car then is lowered to the yard level where it comes to a stop and the empty car is replaced with one that is loaded.

The platform is hoisted at a maximum speed of 75 feet per minute and as the discharging point is approximately 46 feet from the starting point, it is apparent that a round trip can be made in a little over 1½ minutes. The control is designed in such a manner that if necessary, the platform may be stopped at the level of the regular charging platform so that the cars may be placed in storage and later



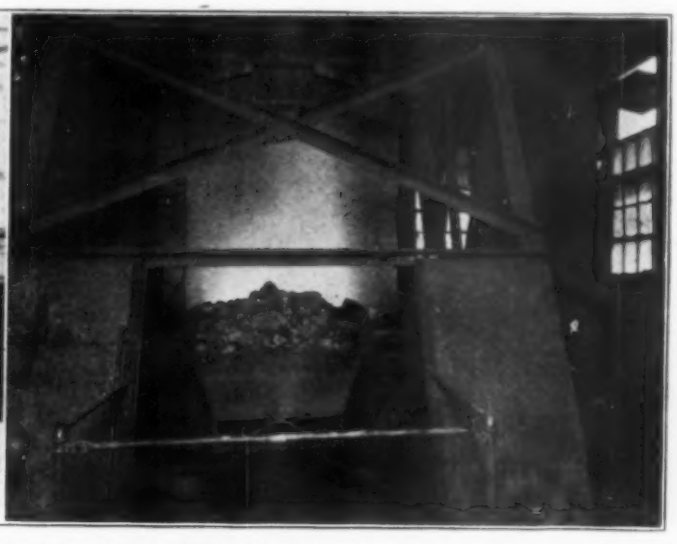


FIG. 1—LEFT, PART OF THE STOCKYARD WHICH IS SERVED BELOW BY A TRANSFER CAR AND ABOVE BY A GANTRY CRANE.
FIG. 3—RIGHT, COKE CAR IN FRONT OF CUPOLA DOOR

emptied into the cupola in the usual manner. Safety switches are provided at the top and bottom of the hoist to act in the rather remote possibility that the limit switch may fail to function. A solenoid on the engine will hold the load when the power is off.

Prior to the installation of the skip hoist 11 men were employed to handle the daily charge of 105 to 110 tons. The present melting capacity is 160 tons and all the material is handled by five men. One man makes up the coke charges. Two men shift and move the cars to and from the hoist. Part of the time the gantry crane man is employed in loading the charging cars. One man on the charging floor controls the dumping of the material in the cupola.

Chemical analysis and physical characteristics of the iron have been satisfactory. Neither operation of the cupola nor coke consumption have been affected since the adoption of the new method which was placed in operation Feb. 9, 1925 and has been in continuous use since that time.

Hoisting equipment includes a 40 horsepower slip ring type motor which drives a 30-inch diameter drum. A suitable speed is secured through a train of heavy cast steel gears. Motor, gears, drum and limit switch are mounted on a rigid structural steel base. The limit switch permits automatic operation. Once the controller is started, the skip is hoisted, dumped and returned to the yard automatically. Through a drum type controller also provided the operator has better control during the dumping operation and in that manner he can spread the charge uniformly. The skip hoist idea originated with the engineers of the Griffin Wheel Co. It was designed and erected by the C. O. Bartlett & Snow Co., Cleveland.

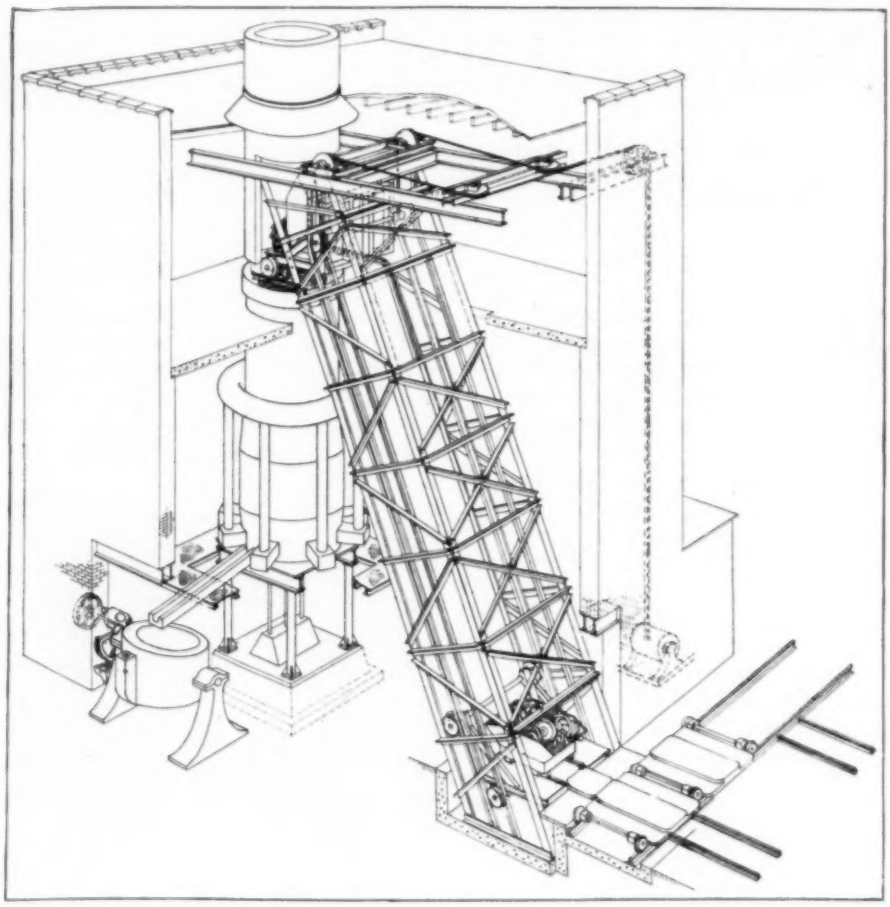
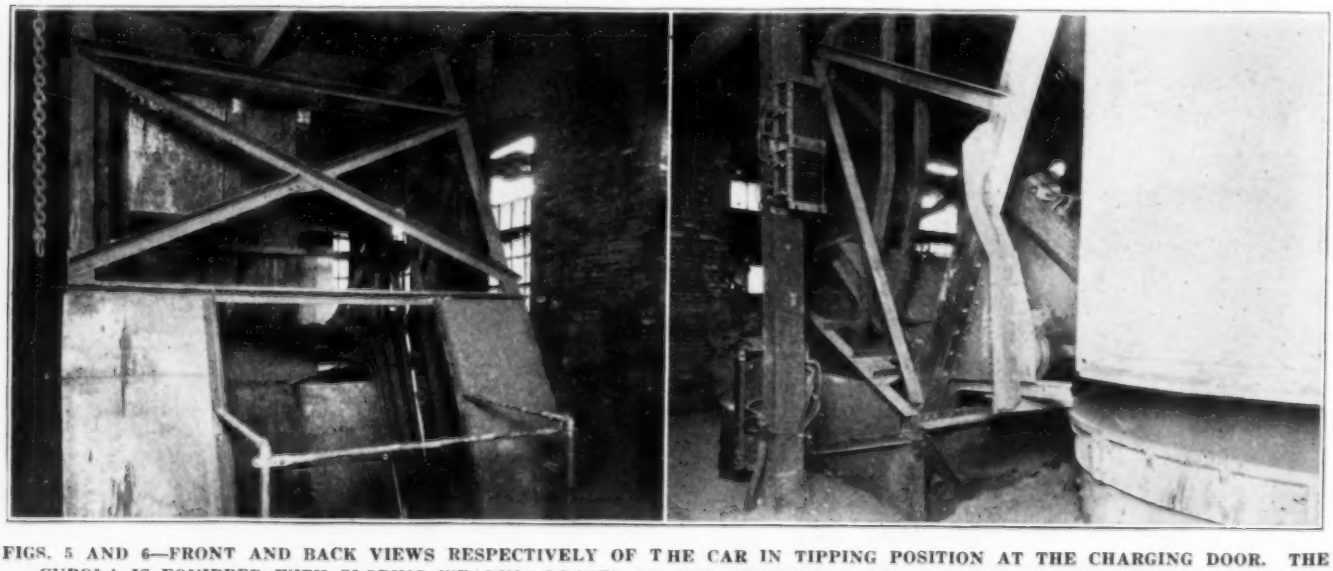


FIG. 4—PERSPECTIVE SKELETONIZED VIEW OF SKIP HOIST AND ITS APPLICATION

Appointed Professor

Dr. Wheeler P. Davey, member of the research staff, General Electric Co., Schenectady, N. Y., has been appointed professor of industrial research at Pennsylvania State college, State College, Pa., effective Sept. 1. Dr. Davey was graduated from Western Reserve university, Cleveland, in 1906 and received his doctor's degree from Cornell university, Ithaca, N. Y., in 1914. He joined the General Electric research staff that year.

W. B. Wallis, president of the Pittsburgh Electric Furnace Corp., Pittsburgh sailed from New York City recently on a business trip to Sweden and other European countries.



FIGS. 5 AND 6—FRONT AND BACK VIEWS RESPECTIVELY OF THE CAR IN TIPPING POSITION AT THE CHARGING DOOR. THE CUPOLA IS EQUIPPED WITH SLOPING WEARING PLATES AT THE CHARGING LINE. THE UPPER PART OF THE CUPOLA IS SUSPENDED INDEPENDENTLY OF THE LOWER PART

Bill Explains Variations in Analysis

By Pat Dwyer

LIKE all persons, at one time or another I have wished that Providence had seen fit to cast me for a different role on the well known stage of life. In the early days I was undecided whether I would shine more brilliantly as a dauntless Indian fighter, a combination of Daniel Boone, Kit Carson and Buffalo Bill, or as a member of the secret service so gloriously personified by Old King Brady.

I was deeply impressed by the biographies of these various gentlemen as set forth by highly skilled literary authorities in the Log Cabin and *Beadle's Boy's Library*. These masterpieces might be secured fresh from the press every week for the small sum of a dime for the large edition or a half dime for the smaller issues. The only difference between the two editions was that twice as much gore was spilled in one as in the other.

Dimes and half dimes were even scarcer in those days than they are now. In fact, I cannot remember ever actually buying one of the thrillers, but by a highly perfected system of barter and exchange I managed to complete a fairly extensive reading course in this branch of literature. We carried the books stuffed up under our vests and at recess and after school we interviewed each other and exchanged the goods on mutually satisfactory terms. Outward appearance, frayed edges, style of binding, author's name, presence or absence of covers were looked upon as factors of little or no importance. The only feature considered was whether or not the text was complete from the point where the hero filed the sight of his gun so that he might draw a finer bead, to the climax where the last Indian or the sole surviving member of the villainous band of cutthroats bit the dust. A few chapters absorbed from behind the friendly cover of a geography helped wonderfully to pass away the dreary and monotonous school day. As I said before, if Providence had seen fit to cast my lines in other places I might have continued at school, grown up in ignorance and finally achieved my ambition to swing a wicked gun or maybe two. Unfortunately or fortunately—opinions differ on this point—stern necessity forced me to work before I was 14 and all the two-gun dreams went glimmering. The foundry may or not be a good training school—you also are welcome to your own opinion on this point—but most assuredly it is no place for mental wool gathering or for cultivating dreams of romance and high adventure.

The old gaffer who kept me on the hop from morning until night was no knightly Sir Galahad with kindly and gracious words dripping sweet and smooth as honey from his lips. His vocabulary in some respects was not so extensive as that of the late Mr. Shakespeare, but then on the other hand as you might say, he knew a great many words which even the closest students never have discovered in the somewhat voluminous works of that famous author. He was not hampered by any niceties of composition or grammatical construction and as a result he had acquired an exceedingly fluent and flowing conversational style. If the contents of his conversational tank was analyzed I think it would run about 90 per cent limburger cheese, ancient limburger cheese and 10 per cent sulphuric acid. He also chewed tobacco and squirted the juice ferociously through a dense forest of black whiskers.

In later years and at various times, depending on circumstances, I have fancied myself in the position of a rich man's son with nothing to do but eat, sleep and play, or I have seen myself free and untrammeled, without a care in the world rambling up and down the highways and byways of the world. Each mode of existence presents many alluring and attractive features, but if I actually was pinned down to making a final choice I am inclined to the opinion that the first would win slightly on points. Considered from the depth and comfort of an easy chair the rambling idea is decidedly attractive, but memories of certain job hunting experiences in which I paddled the pavements until my feet were numb, detract somewhat from the enchanting prospect. At this remote date the chance of acting the part of a rich man's son is distinctly outside the realm of possibility. Owing to a regrettable, but perfectly natural oversight I failed to select a wealthy parent on my arrival in this vale of tears. In self defense, if defense is needed in a delicate point of this kind, I might say that I was to-

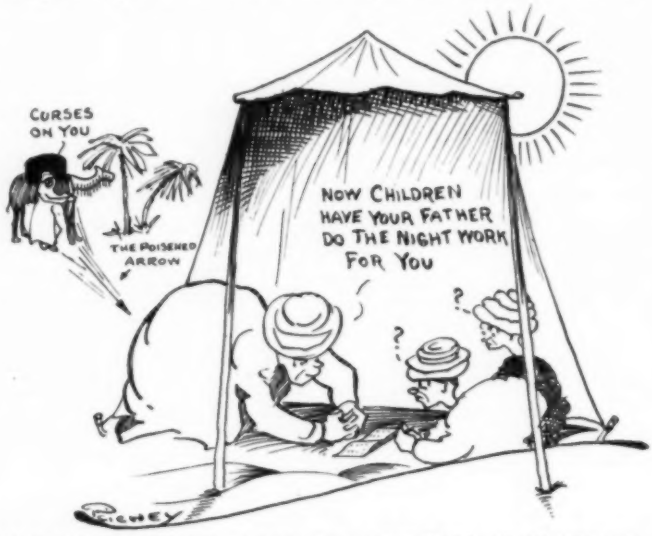
A FEW KIND WORDS FROM THE MASTER

tally inexperienced at the time and was inclined to the belief that kind hearts are more than coronets and simple faith than Norman blood. However, in the course of a fairly long life I have had no cause to regret my early choice. Memory of the kindly heart and the simple faith of my father is as green and vivid as the sod that has rested for many a long year above his lowly resting place on the slope of a sunny hill in an alien land. All wealth is not represented by silver and gold.

Everything in this world, as the late Mr. Emerson pointed out at one time, is governed by the law of compensation. Although I never succeeded in playing any of the roles to which I aspired, I at least escaped being cast for a school teacher. How any person can follow that profession and retain any semblance of sanity always will remain to me a mystery. Old what's-his-name must have had the same idea in mind when he told Horatio that certain things in heaven and earth were too deep for his philosophy. My opinion is based on many year's intimate contact, with that insidious menace to the peace and well being of the home, known as home work. If one or two hour's ordeal at night affects me so violently I cannot conceive how a teacher endures it all day without committing wholesale mayhem on the dear little tots committed to his or her care. A possibility exists that the teacher soldiers on the job, picks out all the easy features, skims the figurative cream and steers all the crabby and crooked problems into the home work. Some day if I can find the time I intend to visit a school and check up on this point. I am not exactly afraid of teachers, but in my young days I contracted a habit of ducking around the block when I saw one approaching and a relic of this bygone aversion, like the traces of original sin still abides with me.

One night recently the youngest scholar told me she had to find the meaning of the statement that if the mountain would not come to Mohamet, Mohamet would have to go to the mountain. I started to explain that the statement simply was meant to illustrate a compromise. That brief and pithy explanation should have satisfied any ordinary person. The young scholar is not an ordinary person. She camped deliberately on my trail which merely is a figurative way of saying that she curled up in my lap and asked enough questions to puzzle the author of an encyclopedia.

Who was Mohamet, did he have any last name, where was the mountain, did it have a name, how high was it, why did Mohamet want to go there, did he intend to climb it, he must have been silly if he expected a mountain to come to him, mountains can't walk, did I ever see a mountain that moved, when did all this happen, did I know Mohamet, did he have any little boys and girls, did they go to school, what was the school like, did the girls have bobbed hair and grade from 3 *B* to 3 *A*, what was the teacher's name, was she a crab, did the kids have to do home work.



IMBIBING A FEW SIPS FROM THE FOUNTAIN OF KNOWLEDGE

Some of the questions I answered with a brief yes or no, but that did not satisfy this earnest seeker after information. Her invariable counter question was, *Why?* At the risk of losing what little respect she has for my standing in the field of general knowledge I shamelessly replied in the majority of cases that I did not know why. However, the last question on the list furnished me a cue to terminate the interview.

When she asked me if the children in Mohamet's time had to do any home work I assured her solemnly that they did not. I might have amplified this statement to the extent that the majority of children in those far off days did not do any school work of any kind, but if I did, I knew instinctively that I would lay myself wide open to the query why children have to do so now. I often have speculated on that point myself, but since I never have found a satisfactory answer, I naturally hesitated at interjecting this feature into the discussion.

Sticking strictly to the facts in the case—my guess is as good as that of any other person—I explained that Mahomet's children once had brought home some school work and had solicited his help in solving the various problems. The old man had promptly thrown the exercise books in the stove and banished the children to bed without any supper. On the following day he had called at the school and carefully shot the teacher with a long poisoned arrow.

The young lady contrary to her former activity in squirming around in my lap had remained strangely quiet during the recital of this touching bit of ancient and authentic history. The little eyes were closed and so was the busy little mouth. Her breathing was slow and gentle and she lay there, limbs carelessly relaxed, perhaps the most beautiful picture in the world, a sleeping child. When I directed her mother's attention to the fact that the little lady was asleep I found I had committed a tactical error. Instead of receiving a hearty vote of thanks I was censured severely on two points. First because I had wasted an entire night filling the child's mind with a lot of silly missinformation. Second because now *some* person, with a martyr like emphasis on the *some* would have a battle in undressing the victim and putting her to bed. 'Tis a hard world, mates.

Under ordinary circumstances I might have been tempted to debate these two points, but enough is sufficient for one night. I discreetly retired to the veranda to have a quiet smoke or two in peace and comfort. Here I was joined by Bill a few minutes later who greeted me colloquially with "Well, what do you know?"

Usually I consider that particular form of salutation the silliest of the many inane stereotyped phrases used by people on meeting each other. In this instance it seemed singularly appropriate. I told him I knew practically nothing and in support of the statement I recited my experience in trying to answer a few simple questions earlier in the evening. Bill professed to be highly amused.

"Well," he admitted. "I'll tell you. Answering questions sometimes is a puzzling proposition. Only comparatively few questions can be answered by a plain yes or no. The difficulty is increased where the question is stated in a letter and no opportunity is presented to discuss many related features inadverently omitted, but

which are vital to a thorough understanding of the subject. I had a letter the other day from a lad who could not understand why two castings poured from the same mixture showed such a wide variation in analysis.

"He said he had poured two water cylinders for a steam pump which weighed approximately 1650 pounds each with an average metal thickness of 1¾ inches. He used a 40 per cent steel mixture and made up two 1500-pound charges to an anticipated analysis of silicon 1.28 per cent, manganese 0.91 per cent, phosphorus 0.28 per cent, sulphur 0.09 per cent. The casting poured from the first tap showed silicon 0.89 per cent, manganese 0.91 per cent, phosphorus 0.21 per cent, sulphur 0.09 per cent, total carbon 2.80 per cent, combined carbon 1.44 per cent. Analysis of iron from the second tap came within one or two points of the anticipated analysis with silicon 1.27 per cent, manganese 0.98 per cent, phosphorus 0.19 per cent, sulphur 0.08 per cent, total carbon 2.86 per cent, combined carbon 0.80 per cent. The only theory he had was that most of the steel must have got into the first casting, but since the first casting took the entire first charge and the second casting took the entire charge, this theory did not seem quite satisfactory. The cupola is lined to 44 inches and 950 pounds of coke are placed on the bed with 150 pounds between the 1500-pound charges of iron.

"This peculiar discrepancy to which he referred might have been due to one of two causes and since the first is the more probable of the two I touched upon that first. In the majority of furnaces the bottom is not hot enough when the first iron trickles down and as a result the iron is chilled, the silicon is thrown out and the carbon unites with the iron in the combined form. This condition is accentuated where a large part of the charge is made up of steel, with only a trace of silicon and a strong affinity for carbon. This tendency of even ordinary iron to chill in the first part of the heat is so well known that many foundrymen either pig the first small tap or use the iron to dry the ladles. If the metal is held in the cupola until the well is filled up close to the tuyeres, the chilled metal gradually mixes with the hot metal above it and if the metal is exceedingly hot the entire amount may show no ill effect. Theoretically, it is possible to have the bottom sufficiently hot before the first metal descends, but in ordinary practice it rarely is in that condition. Sometimes it actually is damp enough to set up a boiling action in the first iron that comes down.

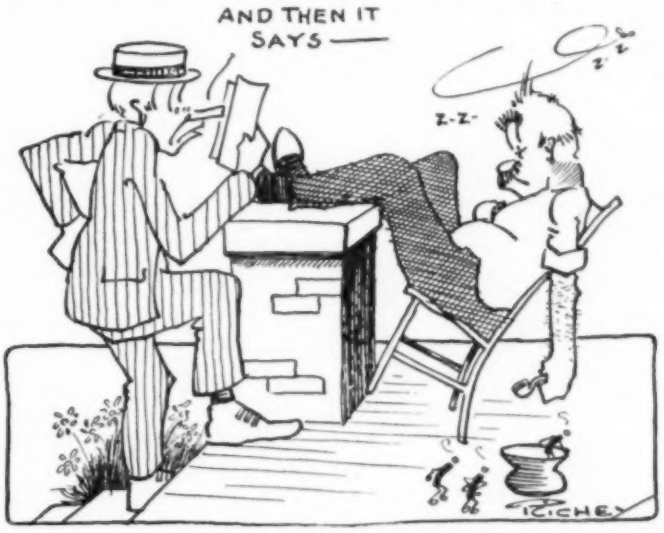
"My theory for the second cause was based on a literal interpretation of the statement in the letter that the first casting poured from the first tap took the entire first charge, while the second casting poured from the second tap took the entire second charge. I intimated that I could not see how he expected to pour two 1650-pound castings from two 1500-pound charges. Ordinary foundry precaution would suggest at least 2000 pounds of iron in the ladle the first time. This margin is slim enough to provide for runners, risers, fins, runoffs, spills and a small drop to stand by with in the event of a runout or a kick from the cores. The furnace loss in melting high percentages of steel is greater than in melting ordinary gray iron. This means that a considerable part of the steel in the second charge was tapped into the first ladle. Probably 200 pounds of this metal remained in the ladle when the second tap was made and that accounts for the metal in the second casting approximating the desire analysis. To secure a uniform mixture for both castings he should have made up two 2000-pound charges, tapped the entire amount into one ladle and then poured both castings. Any small amount of iron remaining in the ladle, if hot enough, would be so diluted by the next tap of ordinary iron that it might be poured into miscellaneous castings where a small proportion of steel in the mixture would have no effect. If the iron was not hot enough, or if for any reason the ladle was not going back under the spout, the iron might be poured in the pig bed or disposed of to advantage in some other manner.

"Mixtures containing high percentages of steel are exceedingly tricky and require expert manipulation and close watch on the cupola. A 150-pound split of coke in a 44-inch cupola is not thick and at the speed with which a 44-inch cupola melts some of the iron in each following charge finds its way down into the preceding charge. Nice judgment is required on the part of the melter to tap the iron so that the furnace is emptied of one metal before the second enters the well. Molten iron continually is coming down while the blast is on and the only way to effectually separate two different mixtures is to place a double split of coke between them. Even then only an experienced melter can tell when the momentary slackening in melting speed takes place." "Talking about questions and answers," said Bill, "Reminds me of a story that drifted in from a Central avenue party Saturday night. Every person was having a good time at this party except one lanky, lonely looking colored girl sitting over in a corner of the room. She had been a wallflower all evening. After a while a tall, black-velvet complexioned young gentleman walked over to her and said, 'Scuse me, Miss young lady, but ain' yo' name Miss Magnolia Johnson?'

"'Yes Suh, ma name Miss Magnolia Johnson.'

"'Well, Miss Magnolia, is yo' program fill' yet?'

"'No, suh, mah program ain' fill'. No suh. Gawd knows mah program ain' fill'. Cause why mah program ain' fill' all I bin had to eat dis evenin' was jes' one slice o' watuh million!'"



MODERN VERSION OF THE ANT AND THE SLUGGARD

To Open Branch Office

Alexander Haigh, dealer in foundry equipment, 200 Devonshire street, Boston, will open a branch office in Detroit. He also will be exclusive agent in Michigan for sand preparation machinery manufactured by the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

W. C. Lloyd, 913 Empire building, Pittsburgh, has been appointed Pittsburgh representative by the Milwaukee Electric Crane & Mfg. Corp., Milwaukee.

Patterns Need Good Lumber

Patternmaker Should Know Kinds of Wood Best Adapted to the Various Types of Work

By Clarence F. Nelson

PATTERNS are made either of wood, metal or plaster of paris, the most commonly used being wood. This is due to the ease with which wood may be shaped, glued, and screwed together, forming a pattern of great durability and lightness. Varieties and characteristics of the woods are numerous. The action of green sand and the usage should determine the most suitable wood to use. In a modern pattern a great many kinds of woods may be found.

Familiarity with the growth, structure, and properties of the various woods is essential in the selection of pattern lumber. Many pattern makers and other craftsmen know only two grades of wood, namely hard and soft. While this classification is easy to determine, the real grades of interest to the patternmaker are dry and water woods. The dry varieties are from trees grown on high land having little rainfall or moisture. These woods, whether hard or soft, are good for patternmaking as the slow growth, due to limited moisture, causes the wood cells to be of close formation. A pattern of this lumber, when put in green sand, will have little tendency to absorb moisture and become warped or distorted.

The other type is known as water wood, and is composed of trees found in low lands having abundance of moisture, such as marshes and swamps. The quick growth causes the cells to be open and the texture to be spongy. Therefore, its adaptability for patterns is limited to patterns for a one casting job or where the pattern does not come in contact with green sand. However, it is a good rule to eliminate the latter type from the lumber rack, as it often is used by mistake.

The different varieties of pattern lumber used are as follows:

White pine is the pattern lumber most universally used and it is becoming scarce. Sugar pine may be used and in many cases in found entirely satisfactory. Sugar pine trees are large, the cells are open and the texture is light and spongy.

Baywood, a species of mahogany, fast is crowding the white pine for supremacy. Many shops use this exclusively in preference to pine for it is exceptionally a durable, light and easily shaped wood of straight grain and close texture. It does not check or shrink much and will warp only slightly compared to other kinds of mahogany.

Mexican and Spanish mahogany are used but little as the former is not straight grained and warps considerably in the sand, while the latter is of a wavy and knotty nature. These woods may be used in patterns of small solid types. When properly shellacked they make a favorable job but for large surfaces or where intricate machine work is necessary these woods should be eliminated.

Yellow pine is used in some shops in the south for large cylinder work as the ease in turning makes it desirable.

Cherry is the best hard wood for patterns that are of intricate design and too large to be made of metal. Patterns made of this wood will stand long runs and hold their size and shape better than when made of any other wood. It is good practice to use cherry lumber properly seasoned for patterns for large match plate work where the use of metal would cause excessive weight. Cherry is exceptionally hard and some of it is hard to work but as a whole it has straight grain and warps only slightly.

Redwood is a large tree grown in the Southwestern states and is used considerably on the Pacific coast for patterns. It is of large open texture and splinters easily. The wood is not exceptionally durable but patterns made of it and shellacked heavily stand up for a short run. The following woods are favorable for patterns but the scarcity and cost prohibits their use. Black walnut, boxwood, rosewood, vermillion, etc. The odds and ends of furniture factories contain some of these woods and make durable small patterns.

The following woods should not be used for standard patterns as their structure and texture are unfavorable: Oak, maple, gum, spruce, chestnut, cypress, whitewood, cottonwood, alder and hemlock.

The next step in selecting lumber is to obtain a knowledge of the way the lumber was seasoned. I remember when working as an apprentice, the firm for which I worked bought lumber in a more or less green state by the carlot direct from the sawmill. When it arrived at the plant a make shift shelter was provided consisting of four uprights and a slab roof. The lumber was piled here to season regardless of size, shape or condition. However, the lumber never had sufficient time to season properly for it was used as fast as it came, the result being a mess of checked, warped, and distorted patterns. The lumber was not suitable for flask lumber, yet it was used for patterns.

I recall another incident where a new manufacturing company, about to start operations, advertised for patternmakers and I was the first to be hired. Arriving with my tools I inquired as to the whereabouts of the pattern shop and was informed that they expected me to work in the machine shop with the tool and die makers without even a vise with which to work. When I asked for the lumber rack, I was told by the superintendent to get my saw and come with him. He took me to an old shed in the rear of the plant and pointed to the left to 8 x 8-inch x 16-foot stringers. He said that they should last me a long time. They have their patterns made outside now.

The best way to season lumber and most practical way in general use is to air season for 12 to 18 months. Often it is not thoroughly dried when it comes from the mill. Later it should be kiln dried for 18 to 24 days. This makes good lumber for pattern use.

When air seasoned, the lumber, as it comes from the saw mill, is piled in such a way as to allow the air to circulate around each piece, and is allowed to remain in the open for 2 to 3 years, depending on the size of lumber. Each pile is built in such a way as to shed water and is roofed to prevent excessive rain falling on the pile.

Kiln drying is a good practice where lumber is to be subjected to heat and is accomplished in the following manner. The lumber is air seasoned somewhat before it is placed on large trucks or cars which travel on rails similar to those in core ovens. The lumber is placed in such a way as to allow the free circulation of air around each piece.

The ovens are large and take care of many thousands of feet of lumber at once. When the kiln is filled, it is heated to a temperature of 140 Fahr. this temperature is maintained for the entire time lumber is in the

kiln. Large blowers of high velocity are used to produce rapid circulation and to remove the moisture as it is evaporated from the lumber. This process requires 8 to 12 days according to the thickness of lumber.

Care is taken to keep an even heat, as an excessive temperature causes hasty drying hence the moisture in the woods fibers separate by the steam generated, causing checking, and considerable shrinkage.

Adopts Core Method for Casting Manifolds

By William Pink

Relative cost usually is the determining factor in deciding which of several methods is preferable in producing any given lot of castings. The claim is not advanced that the method of making manifolds shown in the accompanying illustration is the best or most economical under all conditions, but it proved quite satisfactory at the time it was tried and may be adapted successfully in the production of a varied line of castings. It presents all the merits of a dried mold without the attendant expense of flask equipment. Frequently as in the instance illustrated it is possible to pour the mold in a vertical instead of a horizontal position and thus dispense with the use of chaplets.

The pattern is split in the usual manner and mounted on a board, but instead of using a flask the pattern is surrounded by a plain rectangular frame that serves as a corebox. A number of cores are made with one half of the pattern in place, then the second half of the pattern is substituted for the first and corresponding number of cores are made. Later the two halves of the core are assembled to form a complete mold. In Fig. 1 the first half of the pattern is shown in place on the board, together with the runner, gate, riser, and vents for the jacket core. The runner and gate are omitted when the second half of the pattern is placed on the board. The dowel pins on the board are arranged in such a manner with relation to a center line that the halves of the mold will coincide perfectly when the joint surfaces are brought together.

After the cores are dried they are assembled on a pair of trestles. Core *A* is placed face up on the trestles and the lower half of the jacket core is lowered into position. This is followed in turn by the main core and the top half of the jacket core. The top core *B* then is set on and the two halves are clamped together, placed in the oven for a short time and then set up on end on the floor. The joint of the cores may be daubed or the entire core may be rammed inside a number of suitable drags.

Heavy Cast Iron Saucers Crack in Service

Question: We have had complaints from a customer over the unsatisfactory service of an acid pot 8 feet 5 inches extreme outside diameter, 78 inches inside diameter and 14 inches deep on the pot proper which is 4 inches thick. An extension 9 inches deep and 1½ inches thick extends all around the top of the pot with the exception of two openings, one 28 inches wide and the other 22 inches wide diametrically opposite each other. These pots are heated to 400 degrees Fahr., and then the contents are removed and a fresh charge of salt is placed in the pot while it still is hot. Castings crack on the bottom and only last from 2 weeks to six months. At present we use 15 per cent steel in the mixture. Would you favor increasing this to 50 per cent and at the same time reducing the metal thickness in the pot to 2 inches?

Answer: If the pots were exposed to high temperature for a long period the best mixture to use would be the same as that used for car wheels and under your present conditions probably it is the best mixture to use, although other irons might be suggested if your location was different geographically. A temperature of 400 degrees Fahr. does not raise the casting to a red heat and probably if it was not for the frequent fluctuation caused by adding the cold charge to the hot pot, the casting would last indefinitely. With a good strong iron the actual thickness of the casting, 2 or 4 inches is not a feature of major importance. Usually this point depends on whether the casting is sold by the pound or on a unit basis. To a certain extent the thick bottom presents a factor of safety, in that the change of temperature naturally cannot take place as rapidly as with a thin bottom. This casting really belongs to a class that should be poured from air furnace iron, but since that method is out of the question in your case we suggest the use of bessemer iron in which the total carbon may be lowered by a generous addition of steel. The bessemer iron may be available either as pig iron or scrap ingot molds.

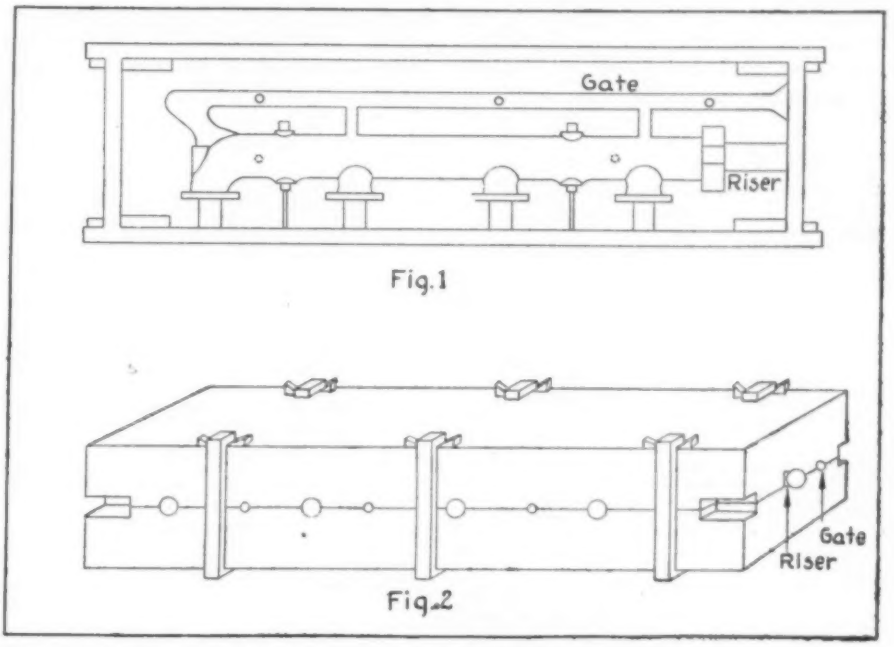


FIG. 1—PATTERN IN PLACE WITH THE GATE AND RISER ATTACHED INSIDE COREBOX. FIG. 2—COMPLETE CORE MOLD CLOSED AND CLAMPED

Publishes Handbook

Electrical maintenance men will be interested in the bureau of standards handbook No. 7. This pamphlet contains part three of the National Safety Code dealing with the installation and maintenance of electric utilization equipment, and has been revised to conform with the changes made by the American Engineering Standards committee.

American Cast Iron Pipe & Foundry Co., Birmingham, Ala., has moved its New York office from 261 Broadway to 165 Broadway.

Canadian Foundry Makes Large Runner

(*Concluded from Page* 601)

cores then was rammed full of sand.

The cope was made by striking the impression with a sweep, and ramming the cope on the impression. An iron flask suitably barred was used in making the cope. That part of the mold was dried by pans of charcoal, as it was not convenient to get the cope to the oven. The cope was placed on the mold after drying, was fastened down with binders and the pit rammed up all around with sand.

The metal was poured into a basin which fed suitable pop gates. The manganese bronze was melted in city gas fired crucibles of the surface combustion type each holding 1200 pounds of metal. Over 5000 pounds of metal was placed in the ladle.

Tentative Program Is Announced

ONE of the most complete programs of technical papers ever offered for consideration by the American Foundrymen's association, just has been announced by Robert E. Kennedy, technical secretary, for presentation at the Detroit Foundrymen's congress, Sept. 27 to Oct. 1. Practically every branch of the industry and every phase of foundry and metallurgical practice is represented on this program. As in the past the sessions are divided into main groups, which will permit the visitor to schedule his attendance at those meetings which will interest him most directly. The tentative program as announced, follows:

Monday, Sept. 27

AFTERNOON

1:30—*Opening Meeting.*
Addresses of welcome and responses.

3:00—*Nonferrous Metals.*
Joint meeting of American Foundrymen's association and Institute of Metals Division.
"Constitution of Aluminum-Zinc-Tin Alloys and Aluminum-Zinc-Cadmium Alloys," by Dr. V. Jares, Technical school, Prague.—Exchange Paper of Czecho-Slovak Foundry association.
"Aluminum-Alloy Permanent Mold Castings," by Dr. R. J. Anderson, Cleveland.

3:00—*Materials Handling.*
"Materials Handling in a Foundry," by E. T. Bennington, Cleveland Crane & Engineering Co., Cleveland.
"Saving Foundry Materials Handling," by H. J. Payne, Society for Electrical Development, New York.

3:00—*Core Binders and Cores.*
"Core Oil Specifications," by V. A. Crosby, Studebaker Corp., South Bend, Ind.
"Core Binders Investigation," by H. L. Campbell, University of Michigan, Ann Arbor, Mich.
"Core Sand Mixture Tests," by C. A. Hansen, General Electric Co., Schenectady, N. Y.

Tuesday, Sept. 28

FORENOON

10:00—*Steel Founding.*
"Defects in Steel Castings," by J. M. Sampson, General Electric Co., Schenectady, N. Y.
Contribution by R. A. Bull, Electric Steel Founders' Research Group, Chicago.

10:00—*Temperature Determination in the Nonferrous Foundry—A Symposium.*
Joint meeting of American Foundrymen's association and Institute of Metals Division.
A. A. Grubb, Ohio Brass Co., Mansfield, O.
H. M. St. John, Detroit Lubricator Co., Detroit.
Kirtland Marsh, Aluminum Co. of America, New Kensington, Pa.
R. R. Clarke, General Electric Co., Erie, Pa.
Representative, bureau of standards, Washington.
A. S. Hall, Thwing Instrument Co., Philadelphia.
R. D. Bean, Brown Instrument Co., Philadelphia.

10:00—*Apprentice Training.*
Discussion of apprentice training.

AFTERNOON

12:15—*Round Table on Brass Foundry Topics.*
Luncheon meeting and informal discussion.
Joint meeting of American Foundrymen's association and Institute of Metals Division.

2:00—*Permanent and Long Life Molds—A Symposium.*
J. E. Hurst, Newton, Chambers & Co., Ltd., Sheffield, England.
H. A. Schwartz, Cleveland.
Leon Cammen, American Society of Mechanical Engineers, New York.
S. M. Udale and H. P. Kimber, Holley Carburetor Co., Detroit.
James A. Murphy, Hamilton, O.
Dr. Richard Moldenke, Watchung, N. J.

2:00—*Cupola Practice.*
"Melting All Steel Heats in the Cupola," by T. F. Jennings, Garfield Copper Co., Garfield, Utah.
"A Study of Iron Melted in the Cupola," by R. E. Wendt and J. P. Walsted, Purdue university, Lafayette, Ind.
"Use of Continuous Iron Temperature Charts in Improving Cupola Practice," by H. W. Dietert, U. S. Radiator Corporation, Detroit.
"Cupola Practice in a Continuous Foundry," by H. Rayner, Dodge Bros., Detroit.

Wednesday, Sept. 29

FORENOON

10:00—*Steel Foundry Metallurgy.*
"Open-Hearth Slags," by W. C. Hamilton, American Steel Foundries, Granite City, Ill.
"Manufacture of Manganese Steel for Castings," by John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

10:00—*Testing Cast Iron.*
"A Shearing Test for Cast Iron," by G. K. Elliott, Lunkenheimer Co., Cincinnati.
"Tests of Cast Iron," by W. Rother, Buffalo Foundry & Machine Co., Buffalo.
"Some Further Gray Iron Problems," by John Shaw, Brightside Foundry & Engineering Co., Sheffield, England. Exchange paper of the Institute of British Foundrymen.
"Testing Iron," by M. le Thomas, Paris, France. Exchange paper of the French Foundry Technical association.

10:00—*Malleable Cast Iron.*
"Some Controversial Matters Pertaining to Malleable Iron Castings," by Enrique Touceda, Albany, N. Y.
"What May Be Required of Malleable Cast Iron," by H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland.

10:00—*Casting Nickel Alloys.*
Meeting of Institute of Metals Division American Institute of Mechanical Engineers.

AFTERNOON

2:00—*Foundry Costs.*
Discussion of general needs for foundry cost methods and exposition of a specific foundry cost system for practical use.

2:00—*Foundry Refractories.*
Report of the chairman of the joint committee on foundry refractories.
Report of subcommittees on survey of service conditions: a. Steel foundries; b. Malleable foundries; c. Cast iron foundries.
Report of subcommittee on testing and specifications.
Report of subcommittee on standardization and simplification.
Discussion of foundry refractories.

Thursday, Sept. 30

FORENOON

10:00—*Foundry Sand Control.*
Reports of subcommittees of joint committee on molding sand research, discussion of methods for practical shop control of foundry sand conditions.

AFTERNOON

12:15—*Round Table Malleable Foundry Problems.*
Luncheon meeting and informal discussion of malleable foundry topics.

1:30—*Business Meeting.*

2:30—*Cast Iron.*
"The Dilatometric Analysis of Iron," by A. Portevin and P. Chevenard, Exchange Paper of the French Foundry association.
"Heat Resistant Cast Irons," by Oliver Smalley, New York.
"The Perfecting of Pig Iron," by Dr. Piwowarsky, Technical high school, Aix la Chapelle, Germany. Contributed on behalf of the German Foundrymen's association.
"Phosphorus in Cast Iron," by J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.
"Chaplets in Heavy Iron Castings," by Ivan Lamoureux. Exchange Paper of Belgium Technical Foundry association.

2:30—*Elimination of Waste in the Foundry Industry.*
Discussion of possibilities of elimination of waste.
Report of committee on pattern equipment standardization.
Report of committee on corrosion of metals.

Friday, Oct. 1

FORENOON

10:00—*Foundry Sand Control.*
"Metallurgical Control of Foundry Sands," by L. B. Thomas, Fairbanks Morse Co., Beloit, Wis.
"Grading Foundry Sands," by C. A. Hansen, General Electric Co., Schenectady, N. Y.
"Foundry Sand Control," by O. E. J. Abrahamson, American Radiator Co., Buffalo.

Issue New Catalog

Practically every foundry need, whether it be a new cupola or a molder's sponge, may be found in the new catalog just published by the S. Obermayer Co., Chicago. The book is 6 x 9 inches and contains 352 pages. Each article or piece of equipment is featured by an illustration and a description which aids considerably in making a selection. The catalog also contains tables and other information that the foundryman will find useful.

Milestones in Foundry Progress

As Recorded in the August Issues of THE FOUNDRY, Thirty, Twenty and Ten Years Ago

1896

GROVER CLEVELAND

FOUNDRY cranes were attracting much interest in the roaring days of '96, according to the August issue of THE FOUNDRY for that year. A. E. Outerbridge Jr., William Sellers & Co., Philadelphia, in an interesting discussion showed the types of cranes then available, ranging from the hand type jib, through the steam pneumatic to the then new electric traveling bridge type crane, now so familiar in foundry service. He cited an old paper showing the presentation of a medal in 1767 to Mr. Pinchbeck by the Society of Arts, British, for a type of crane in which the motive power was furnished by men walking inside a form of human squirrel cage.

* * *

Such a crane might furnish a job for retired long distance runners.

* * *

Business was slow in the summer of 1896, although the editor remarked that the hourly, daily and weekly requirements of seventy millions of people implied an early increase in orders.

* * *

Castings which formerly required a large number of cores are today being made in green sand, altogether.

KRANK'S KORNER

* * *

This tendency has continued through the past thirty years. Witness the first automotive cylinder made entirely in cores and compare with the practice in larger production shops in the country in this year of grace, 1926.

* * *

No. 2 foundry iron was selling for $11.50 a ton, Pittsburgh.

* * *

James Chalmers, according to his chronicler, W. Edward, tired of St. Louis, bummed to Kansas City and then with a fellow hobo hit a cattle car in a train for Chicago. Discomforts encountered standing among the crowded cattle culminated by the two finally finding repose on the backs of two wild western steers, which they forsook at Decatur to proceed to Detroit.

* * *

E. J. Condon, Birmingham Iron Foundry, Derby, Conn. advised how to burn wobblers and necks on rolls.

Faked Foundry Facts

A Chill

1906

THEODORE ROOSEVELT

MANUFACTURER'S Foundry Waterbury, Conn., one of the first foundries in the country to make automotive castings, was described in the issue of August, 1906. The cylinder blocks for a two-cylinder automobile were made largely in cores, and as many coremakers as molders were employed.

* * *

An interesting comparison is furnished by the quotation from the superintendent, L. N. Perrault, who told the writer of the article that he was prepared to employ ten men and give them $4 a day, "but we want crackerjacks and the crackerjacks will feel at home here."

* * *

This amount hardly would buy gasoline and eating tobacco for the modern crackerjack.

* * *

An English type hot-blast cupola was described, involving a cast iron ring shaped chamber immediately below the charging door, from which the air was drawn for the blast.

* * *

Ralph H. West, at present proprietor of the West Steel Castings Co., Cleveland, gave a number of comparative designs of air furnaces, with data on their operation.

* * *

An interesting description of the application of the *cire-perdue* or lost wax process of making statuary bronzes was given, from data secured at the plant of the Roman Bronze Works, Greenpoint, Brooklyn, New York.

* * *

Eureka Brass Works, Cincinnati, was removing its plant to Brighton.

1916

WOODROW WILSON

OHIO STEEL FOUNDRY, Lima, O., was featured in the leading article of the August, 1916 issue of THE FOUNDRY, through a description of the method followed in making large cast steel locomotive frames.

* * *

Bradley Stoughton, now in charge of the department of metallurgy, Lehigh University, Bethlehem, Pa., presented a paper on the use of crude oil in cupola melting, at a meeting of the Pittsburgh Foundrymen's association. This was published in THE FOUNDRY of current date.

* * *

A cupola near Philadelphia, operating with this system, reported the expenditure of 60 pounds of coke and 7¼ gallons of oil per ton of iron melted.

* * *

A new safety code for foundries was prepared by a committee of the American Foundrymen's association for report at the Cleveland convention that was called for the week of Sept. 11.

* * *

No. 2 foundry iron was quoted at $19.45 a ton, Pittsburgh.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Wanted:—Knowledge of Prices

SOME months ago at a meeting of the American Iron and Steel Institute, E. G. Grace, president, Bethlehem Steel Co., stated a fact which is becoming increasingly apparent to those connected in any way with the iron and steel industry. After commenting upon the many attainments in perfecting methods of manufacture, Mr. Grace said:

> *I believe that we in the steel industry are called upon to conduct the merchandising side of our business better than we have. We must be better merchants.*

THAT these statements apply with equal force to practically all branches of the foundry industry meets with no question. Foundries in business in this country today can make castings economically; they can meet every requirement of physical and metallurgical specification; they can produce castings in quantity and in quality superior to those made in any previous period of industrial history. *But,* few can sell castings successfully. The greatest universal weakness of the modern foundry lies in its lack of merchandising ability.

Costs have been stressed as a basic element upon which to base selling price, and undoubtedly the foundry which is ignorant of its costs operates under an additional handicap in selling its castings. However, the best cost system in existence today, applied to any individual shop and faithfully followed in pricing castings would fail to cure the ills so prevalent in the foundry industry. The low-cost shop, secure in the knowledge it possesses, may peg the price of its commodity at the point where the margin of profit is narrow. Any competitor uninformed if not ignorant of his costs, bases *his* proffered lower price upon the quoted price of the low-cost shop, in an effort to win away or retain customers and the result is a ruinously low figure on closely contested jobs.

WHAT constitutes a safe measure of castings prices? Is the foundryman justified in accepting a buyer's word on a competitor's figure? If he goes openly to his competitor, assuming even the highest honesty in the exchange of information on prices, is not the party to the interchange of price information flirting with disaster in the form of reproof, if not criminal action, through governmental agencies? These questions have suggested themselves to many foundrymen, and more particularly those engaged in the highly competitive steel castings branch of the industry. The need for some measure upon which to base a price, some tangible market which will give the foundryman an idea of the market price of steel castings is great. The published prices of one of the largest, and also probably one of the lowest cost producers furnish probably the only standard upon which to base a comparison for individual use. But even this assistance is available only to the makers of steel castings. The great number of producers of gray iron, malleable and nonferrous castings have not even this measure of market price.

¶ Conserve Your Energy

MENTAL energy, physical effort and money are wasted each year in various industrial enterprises in developing or trying to develop new processes and methods of manufacture or in reclaiming a product that now is waste. Frederick M. Beckett in his presidential address presented at the general meeting of the American Electrochemical society last spring, called attention to this procedure and remarked, "It is deserving of special emphasis that the great error, the cause of wasted effort, has been found in complete omission of any attempt to estimate the cost of manufacture."

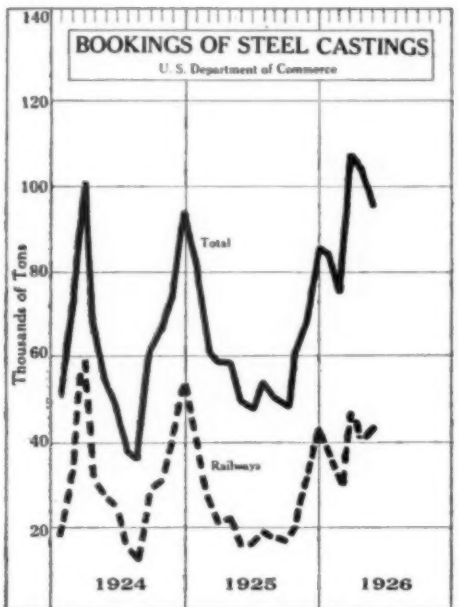
ONE example of misplaced effort may be cited in the foundry chemist who carefully washed burnt sand with sulphuric acid and then with caustic soda. Eventually he obtained sand as pure as the driven snow, but the method was not commercially useful due to prohibitive cost. Any new development should be tested by the rigid rule, *will it pay.* An affirmative answer alone will justify further research, expense or time of foundrymen.

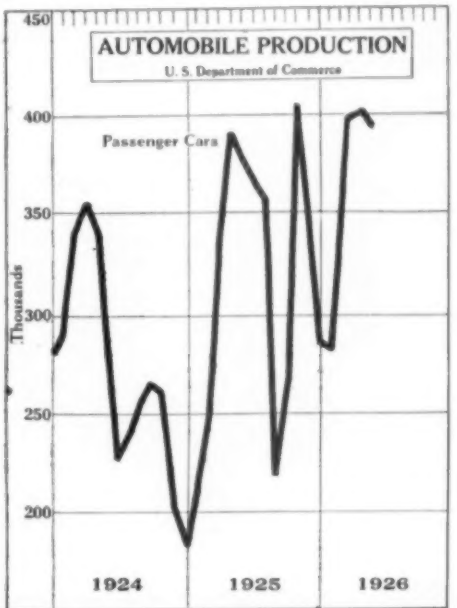
Trade Trends in Tabloid

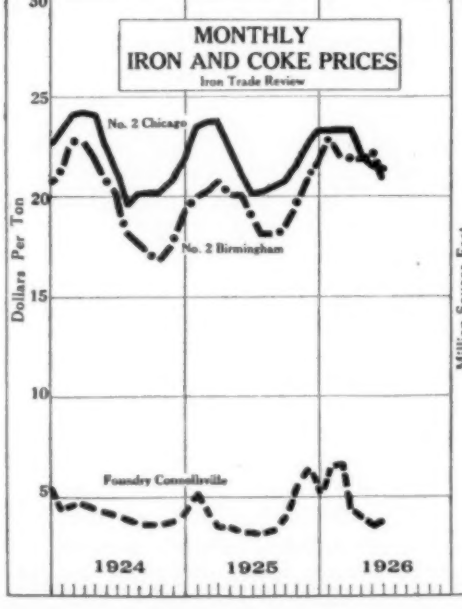
MIDSUMMER slackening is apparent in some lines of foundry activity, notably the gray iron jobbing and stove branches of the industry. Slight declines are noted also in steel castings demand. Specialty shops are slightly less affected, although exceptions are noted. In automotive foundries a wide variation is apparent. One large interest operating its own foundries and buying only a portion of its gray iron castings requirements is operating its shops double shift. A jobbing plant making cylinders has been on 12-hour operation during the first three weeks of July. No figures are available on the automobile production for June, but it is apparent that the totals will be lower than the preceding month, while sales reported on many models in July have been low. Railway equipment and car buying is quiet, although record freight loadings and a recession of idle car totals indicate future requirements. The total of freight car orders for June is given as 4285, against only 448 in May. Agricultural implement business has been satisfactory, and with a continuation of sales through the last half, 1926 should run about 10 per cent ahead of 1925. Steel production is above average, and the demand for electrical machinery is strong. The General Electric Co. reports business for the first half of 1926 about 10 per cent ahead of the same period last year.

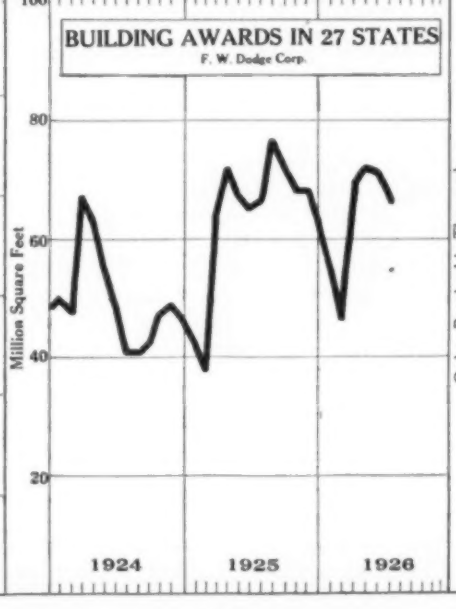
RAW MATERIAL PRICES
July 21, 1926

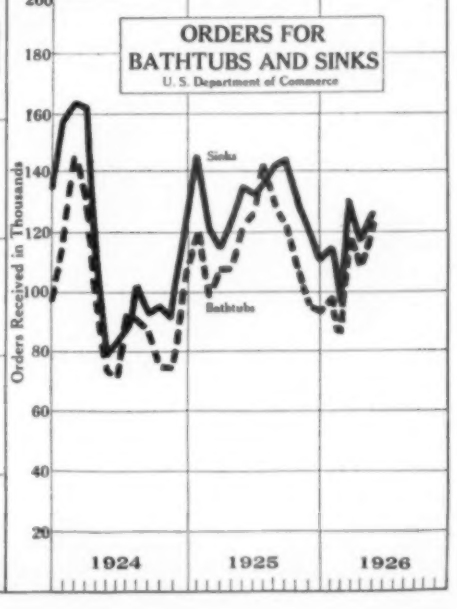
Iron	
No. 2 foundry, Valley	$17.75 to 18.50
No. 2 Southern Birmingham	21.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Philadelphia	21.26 to 21.76
No. 2 foundry, Buffalo	20.00
Basic, Valley	17.50 to 18.00
Basic, Buffalo	19.00
Malleable, Chicago	21.00
Malleable, Buffalo	20.00
Coke	
Connellsville foundry, coke	$4.00 to 4.50
Wise County foundry, coke	4.25 to 5.50
Scrap	
Heavy melting steel, Valley	$16.00 to 16.25
Heavy melting steel, Pitts	17.00 to 17.25
Heavy melting steel, Chicago	14.50 to 15.00
Stove plate, Chicago	14.50 to 15.00
No. 1 cast, New York	14.50 to 15.00
No. 1 cast, Chicago	18.00 to 18.50
No. 1 cast, Philadelphia	17.50 to 18.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Birmingham	16.50 to 17.00
No. 1 cast, Buffalo	16.00 to 16.25
Car wheels, iron, Pittsburgh	16.50 to 17.00
Car wheels, iron, Chicago	17.00 to 17.50
Railroad malleable, Chicago	18.25 to 18.75
Agricultural, mall., Chicago	15.25 to 15.75
Malleable, Buffalo	16.50 to 17.00
Railroad Malleable, Pitts	18.00 to 18.50
Nonferrous Metals	Cents per pound
Casting copper, refinery	13.62½
Electro copper, refinery	14.10 to 14.15
Straits tin	63.75
Lead, New York	8.55 to 8.60
Antimony, New York	14.50
Nickel, electro	39.00
Aluminum, No. 12, prod'rs	26.50
Aluminum, No. 12, remelt	23.00
Zinc, E. St. Louis, Ill	7.50 to 7.55











Personal

Charles Weiss was born in Austria in 1880 and learned the trades of molder and metal patternmaker in Vienna. In 1901 Mr. Weiss came to the United States and became connected with the United States Radiator Corp., Edwardsville, Ill., as a metal patternmaker. He then went to the O. J. McLain Co., Canton, O. and later was in charge of the pattern shop of the Atlantic Radiator Co., for several years. For five years Mr. Weiss was foundry superintendent of the Bi-Loop Radiator Co. He left this firm to become connected with the Central Foundry Co., and then with Prizer & Painter Stove Works. At the present time Mr. Weiss is in charge of the metal pattern shop of the East Penn Foundry Co., Macungie, Pa.

D. W. McGeorge, formerly with the Edgewater Steel Co., Pittsburgh, has been appointed sales engineer of the Birdsboro Steel Foundry and Machine Co., Birdsboro, Pa.

Charles L. Newcomb, Worthington Pump & Machinery Corp., Holyoke, Mass., and a past president of the New England Foundrymen's association has been nominated as a vice president by the American Society of Mechanical Engineers.

L. J. Belnap has been elected president of the Worthington Pump & Machinery Corp., New York, succeeding C. Philip Coleman who is now chairman of the board of directors. Mr. Belnap formerly was president of the Rolls Royce Co. of America, and chairman of the Wills Sainte Claire Co., Detroit.

L. B. Young, formerly general manager, Michigan Stove Co., Detroit, who continued in the Detroit-Michigan Stove Co., after the recent consolidation of those interests, has retired. Mr. Young was connected with the Michigan Stove company for many years, having advanced from office boy to general manager, which position he has held since 1914.

W. M. Corse, vice president and general manager, the Research Service, Inc., Washington, sailed for England, July 14 to investigate various metallurgical subjects. He expects to visit the National Physical Laboratory, Teddington, England and will attend the Institute of Metals meeting at Liege, Belgium, September 1 to 4. Mr. Corse is honorary corresponding secretary for the United States and has been appointed representative of the Institute of Metals of Great Britain to attend the International Foundrymen's congress in Detroit this fall.

Accepts New Position

McDonald C. Booze, senior fellow of the American Refractories institue at the Mellon Institute of Industrial Research, Pittsburgh, has resigned from that position and has been made vice president of the Charles Taylor Sons Co., Cincinnati, in charge of research and development. Mr. Booze was graduated from the department of ceramic engineering, University of Illinois, Urbana, Ill., in 1915. He was plant superintendent of the Medal Paving Brick Co., Cleveland, for two years; ceramic engineer, ceramic experiment station, United States bureau of mines, Columbus, O., for two years; in charge of the ceramic division, research laboratories, Norton Co., Worcester, Mass., for three years, and for the past three years was in charge of the refractories fellowship at the Mellon institute. Mr. Booze has contributed many papers and much valuable information pertaining to refactories and their uses. He is a member of the American Ceramic society, American Society for Testing Materials, and is serving on several committees engaged in technical work on refractories.

M. C. BOOZE

Royersford Foundry & Machine Co. Inc., Royersford, Pa., has moved its Philadelphia sales office to Royersford, Pa.

Officers Are Nominated

The nominating committee of the American Society of Mechanical Engineers has presented the following nominations for 1927:

Charles M. Schwab, Bethlehem Steel Co., Bethlehem, Pa., president; Charles L. Newcomb, Worthington Pump & Machinery Corp., Holyoke, Mass., E. O. Eastwood, University of Washington, Seattle, Edwards R. Fish, Heine Boiler Co., St. Louis, vice presidents; Paul Doty, St. Paul, Ralph E. Flanders, Jones & Lamson, Springfield, Vt., Conrad N. Lauer, Day & Zimmermann Inc., Philadelphia, managers, and Erik Oberg, editor, *Machinery*, New York, treasurer.

Election will be by ballot of the entire membership, closing on Sept. 28, 1926.

To Visit England

Ernest Wooler, chief engineer, Timken Roller Bearing Co., Canton, O., sailed July 4 on the BERENGARIA for England. An Englishman by birth, Mr. Wooler first came to the United States with a party of automotive engineers to study American practices and methods of motor car construction, and remained as engineer of the Continental Motors Co., Detroit. After being connected with several automobile companies, he joined the Timken company in 1925.

Will Build Western Pipe Foundry

The Pacific States Cast Iron Pipe Co., Provo, Utah, has been incorporated with $500,000 of preferred stock and 5000 shares of common stock with no par value. J. R. McWane, president of the McWane Cast Iron Pipe Co., Birmingham, Ala., is president and D. H. Botsford, vice president of the Columbia Steel Corp., San Francisco, is vice president.

Work on the construction of the first unit has begun and operations are expected to start about Jan. 1, 1927. Cast iron soil and pressure pipe will be made. The initial production will be about 50 tons a day.

A Correction

On page 514 of the July 1 issue of THE FOUNDRY, under example 5 in the third column, the last line should read, *raised the carbon 5.2 points*, instead of, raised the carbon 52 points. The figures in columns *D* and *E* at the bottom of the chart are interchangeable, except that in column *D* or *points the element to be raised* is divided by ten.

Obituary

Edgar Rapp, 24, son of A. G. J. Rapp who is in charge of engineering for National Engineering Co., Chicago, was killed July 5 in an automobile accident near Springfield, Ill., while driving from St. Louis to Chicago.

Camille Cavallier, managing director, Societe des Hautes Fourneaux et Fonderies de Pont-a-Mousson, died suddenly in Nancy, France, on July 10. He was 72 years old. Mr. Cavallier took a large part in the exploitation of the famous Briey ore mines in Lorraine. He was one of the pioneers in developing the iron and steel industry in the department of Meurthe-et-Moselle. He always took an active interest in the welfare of his workmen.

Charles Albert Coffin, founder, and former president and chairman of the General Electric Co., Schenectady, N. Y., died recently at his home in Locust Valley, Long Island, N. Y., at the age of 82. His death was attributed to pneumonia. Mr. Coffin was president of the General Electric from its organization until June, 1913, when he was made chairman of the board. He retained this office until 1922. One of Mr. Coffin's achievements in connection with the company was the organization of its research laboratory in Schenectady. Four years ago the General Electric Co., established a fund of $400,000 to be known as the Charles A. Coffin fund. The income is devoted to encouraging study and application of the science of electricity. Mr. Coffin was a member of the New York chamber of commerce and of numerous clubs.

W. W. SANDERSON

Abrasive Company Sales Manager Is Dead

William Welsh Sanderson, general sales manager, Carborundum Co., Niagara Falls, N. Y. died on July 6 at the home of his mother Mrs. William Sanderson, Stratford, Ont., after a long illness. Mr. Sanderson was 46 years old and was born in Brantford, Ont., moving to Stratford when a child. He was one of the few officials of the Carborundum company who had been affiliated with the organization for over a quarter of a century, having joined the firm in 1901.

In 1904 he was appointed to the sales staff and for many years was sales representative in the South. He was made district sales manager in 1909 in the Pittsburgh territory. In 1919 he was appointed general sales manager succeeding George R. Rayner who was made vice president of the company. Mr. Sanderson was exceptionally well versed in all branches of abrasive engineering practice and paid particular attention to grinding wheel standardization. He is survived by his widow, two daughters, his mother, five sisters and one brother.

Will Hold Meeting

The July meeting of the New England Foundrymen's association was an outing held at Tatassit Canoe Club at Worcester, Mass., July 14. A sheep-bake followed by an entertainment were the special features.

Organize New Foundry

Nourse-Criley Meehanite Co., South Milwaukee, Wis., has been formed by Rupert A. Nourse and John R. Criley. The company will exploit a cast iron developed by the Ross-Meehan Foundries, Chattanooga, Tenn. Mr. Nourse for several years has been vice president and general manager of the Stowell Co., South Milwaukee, Wis., and is serving as a director of the American Foundrymen's association.

Foundry Association Directory

The Buffalo Foundrymen
Buffalo

President, J. McARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings the third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, CHARLES L. LARSEN, Armour Institute of Technology, 3200 Federal street, Chicago; secretary-treasurer, E. C. BARRINGER, THE FOUNDRY, 1147 Peoples Gas building, Chicago. Meetings second Saturday in each month at the City Club, 315 Plymouth court.

Detroit Foundrymen's Association
Detroit

President, ROBERT G. CRAWFORD, Atlas Foundry Co., 131 South Artillery street, Detroit; secretary, RUSSELL M. SCOTT, Packard Motor Co., 1580 East Grand boulevard, Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

Metropolitan Brass Foundry Association
New York

President, THOMAS HARPER, Thomas Harper, 204 Lafayette street, New York; secretary, WM. E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meetings second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry, Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meetings called by president.

New England Foundrymen's Association

President, H. P. BLUMENAUER, Arcade Malleable Iron Co., Worcester, Mass.; Secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, WALTER L. SEELBACH, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary, HOWARD EVANS, J. W. Paxson Co., Luzerne and D street, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Pittsburgh Foundrymen's Association
Pittsburgh

President, WILLIAM K. FRANK, Damascus Bronze Co., South avenue, N. S. Pittsburgh; secretary-treasurer, WM. J. BRANDT, Wm. J. Brandt, Bessemer building, Pittsburgh. Meetings on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, J. H. DIEDRICH, Blackhawk Foundry & Machine Co., Davenport, Iowa; secretary-treasurer, A. D. ZIEBARTH, Davenport Foundry & Machine Co., Davenport, Iowa. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.; secretary-treasurer, W. E. DUNN JR., Healey building, Atlanta, Ga. The 1926 convention to be held at Macon, Ga., the date to be announced later.

Tri-City Technical Council
Moline, Ill.

Chairman, H. BORNSTEIN, Deere & Co., Moline, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, J. A. TEACH, Minneapolis Steel & Machinery Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, So., Minneapolis. Meetings monthly at the Athletic club.

Crane Truck Unloads Castings from Cars

Equipment which recently has been installed by a large automobile manufacturer to unload castings from box cars is shown in the accompanying illustration. This small crane truck is sufficiently compact to operate in a standard box car and is used to pick castings from the floor with the magnet and to load them in skid boxes or bags.

The equipment was designed and built by the Baker-Raulang Co., 2180 W. 25th street, Cleveland. The crane has a capacity of 1000 pounds at a 40-inch radius. The truck wheelbase is 40 inches and the tread is 30 inches. The driving wheels are equipped with

THE CRANE TRUCK USES A MAGNET TO HANDLE CASTINGS

3½ x 20 inch tires and the trailing wheels with 3½ x 15 inch. Flexibility in operation is secured by steering with all four wheels. An automatic cutoff opens the hoist motor circuit when the magnet reaches the top of travel, and an automatic interlock controlled by the brake pedal opens the travel motor circuit when the operator leaves the driving platform, or releases the foot pedal. The hoist and magnet controllers are located directly in front of the operator and the hoist may be slowed by conveniently located handles.

The power for operating the travel and hoisting motors as well as the magnet is supplied by a gas-electric unit manufactured by the Ready-Power Co., Detroit. This unit consists of a compound-wound ball bearing generator with a maximum output of 250 amperes at 30 volts, which is belted to a 4-cylinder engine governed at 1000 revolutions per minute.

The magnet is the 20-inch circular type manufactured by the Ohio Electric & Controller Co., Cleveland. The magnet is designed to operate on 1320 watts and is controlled by a switch mounted on the crane, which in turn is operated by the dash controller.

Portable Pyrometer Is Self-Contained

Nonferrous foundrymen have found the use of a pyrometer in determining pouring temperatures to be of considerable advantage. To promote ease of handling and obtain quick temperature readings the Bowen Instrument Co., Leeds, England, has developed a light foundry pyrometer that is self contained. It is constructed in a single portable unit and weighs about 3¾ pounds. The temperature scale is mounted on the ends of the thermocouple and arranged with a clamping device to prevent the needle swinging. No sheath for the thermocouple is needed as the fire ends are coated each time before use with a special insulating solution or with a special paste furnished by the manufacturer. It is claimed that the use of this thin insulating medium allows the true temperature reading to be obtained in 8 to 10 seconds. The temperature scale is about 2½ inches long and is supplied to read from 0 to 800 degrees Cent., or from 0 to 1100 degrees Cent.

Builds Testing Ring

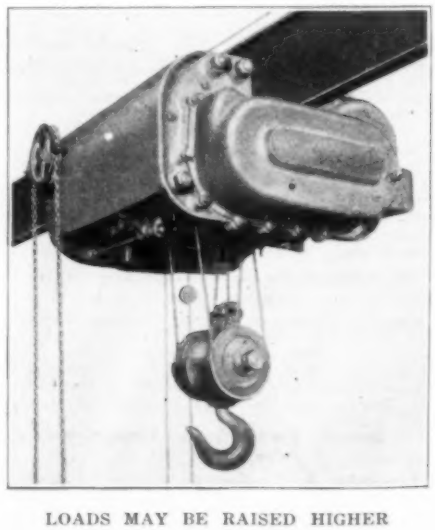
The Morehouse Machine Co., York, Pa., has introduced a proving ring for calibrating brinell hardness testing machines. The accuracy of the brinell machine may be determined readily by placing the ring in position in the machine and reading the deformation on the dial. The load of the machine then is obtained by multiplying the deformation by the constant of the ring. The reading of the dial is made when the conical point of the micrometer screw just touches the reed. This point is indicated by a buzzing sound which is emitted by the reed when it is deflected and allowed to vibrate.

Headroom Is Utilized

Six new electric monorail hoists ranging from 3 to 12 tons in capacities recently have been developed by the American Engineering Co., Philadelphia. These cranes are made for bolt suspension, hand-geared trolley, motor trolley and cab control. As may be seen in the accompanying illustration, the drum and motor are placed on opposite sides of the track. This method of mounting, it is claimed, will allow the load to be raised almost to the rail and permit larger loads to be handled or higher stacking of goods. Hyatt roller bearings are placed on the trolley wheels and ball thrust bearings between the wheels and trolley frame. A straight spur gear drive moves the wheels on both sides of the I-beam track. Removing the cover of the hoist permits inspection of the working parts. A swivel hook on the load block is claimed to make the load easy to turn and guide. An upper limit stop and a dynamic brake are supplied.

Hold Summer Outing

The Pittsburgh Foundrymen's association held its annual summer stag outing at Turner park, Perrysville, Pa. An all-day lunch was served to keep the athletes pepped up. Features of the day were the baseball game between the foundrymen and the supplymen, field sports and quoits.



LOADS MAY BE RAISED HIGHER

Builds Portable Grinder

A portable grinder suitable for foundry use recently has been introduced by the Chicago Pneumatic Tool Co., 6 East 44th street, New York. The machine has three cylinders set 120 degrees apart and each cylinder is provided with its own valve of the piston type. Pistons and toggles are of the pin type and the vent tube is of the centrifugal ball check type. When the machine is not in use the ball check is seated, preventing the loss of lubrication. When the machine is in operation, the ball check is unseated due to centrifugal force, and this causes the crank case to be vented without the loss of lubrication or air.

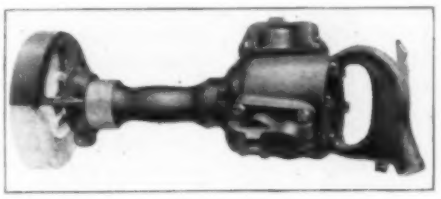
The eccentric straps and the eccentric with the vent tube element may be disassembled quickly by removing the grip handle. Any of the three cylinders, pistons, rods or valves may be disassembled without disturbing the other two elements. The crank shaft may be removed by removing the grip handle and one cylinder. The speed of the machine running light is 4000 revolutions per minute. A wheel or wire brush 6 x 1 inch may be used, while the arbor is ⅝ inches. The grinder weights 15½ pounds.

Three Wheeled Truck Turns Easily

A three-wheeled truck, one of several types manufactured by the Howe Chain Co., Muskegon, Mich., is shown in the accompanying illustration. The truck has a hardwood platform with two malleable iron wheels permanently attached at the rear and a malleable draw bar in the front. A jack tongue which contains a third wheel hooks into the draw bar from the front or side when held in a vertical position. This is said to render the truck easily movable. As the jack tongue is lowered, a cam action is exerted on the draw bar elevating the leg 1¼ inches from the floor and places the forward weight of the truck on the wheel instead of the leg. By using a trailer hitch similar to the jack tongue, several trucks may be attached to form a train. Several different sizes of these trucks are manufactured by the Howe company with platforms varying from 20 x 30 inches to 30 x 60 inches and platform heights of 11 and 15 inches. All sizes have a capacity of 6,000 pounds.

Meet in Conference on Industrial Safety

Need of a complete statistical service for promptly reporting accidents in all branches of industry was outlined at the industrial accident prevention conference called by James J. Davis, secretary of labor and held in Washington, July 14, 15, and 16.



A SPECIAL VENT TUBE OF THE CENTRIFUGAL BALL CHECK TYPE IS USED

Secretary Davis suggested an educational program, consisting principally of three proposals namely:

1. To create in the department of labor an agency, adequately staffed, which should co-operate with existing conditions in bringing together complete accident statistics regarding industries not now covered.

2. To provide for the prompt publication of accident data and its transmission to American industry.

3. To develop in the department of labor an industrial safety museum which should exhibit the latest and most efficient safeguards.

Louis Resnick, assistant to the president, American Museum of Safety, plead for the establishment of a safety museum to function on a national scale, as well as others for states or industrial localities. He gave concrete examples of what the American Museum now is doing to prove what could be done with the plan were it adopted on a broad scale.

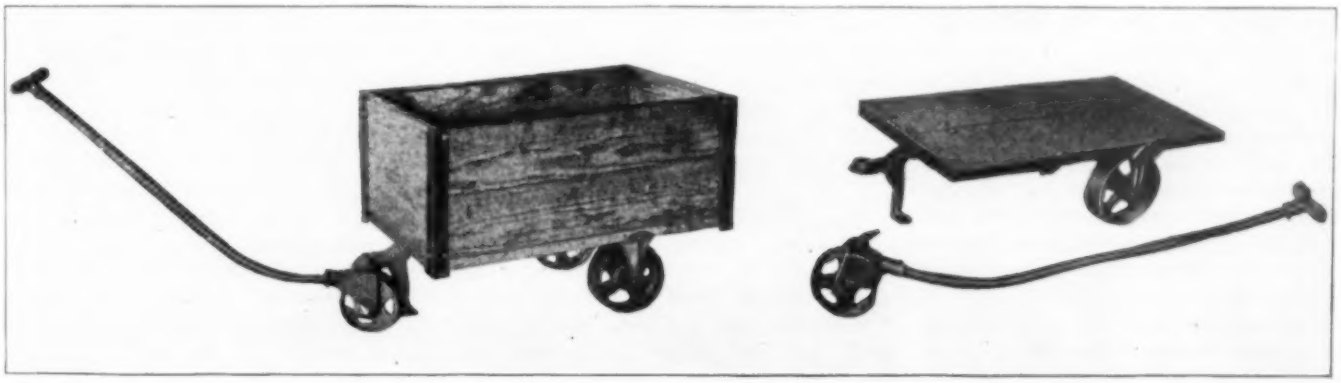
T. F. Jennings, Utah Copper Co., discussed accident prevention in steel, iron and nonferrous metal foundries, stating that the real efficiency of safety precautions lies in the prompt remedying of improper conditions as they arise instead of waiting until an accident forces action. Other speakers discussed safety problems in many branches of industry.

Must Wait for Degree

Nine years henceforth will be the minimum time in which the degree of *engineer* may be won from Lehigh university, according to an official statement recently issued by President Charles R. Richards. Beginning with the entering class next fall, the usual four years course will lead to a degree of bachelor of science in engineering. Five years of acceptable practical experience in responsible charge of work after graduation and the submission of a suitable thesis will be required before the university will grant a degree of engineer in the particular field.

Personnel Changes in Bearing Firm

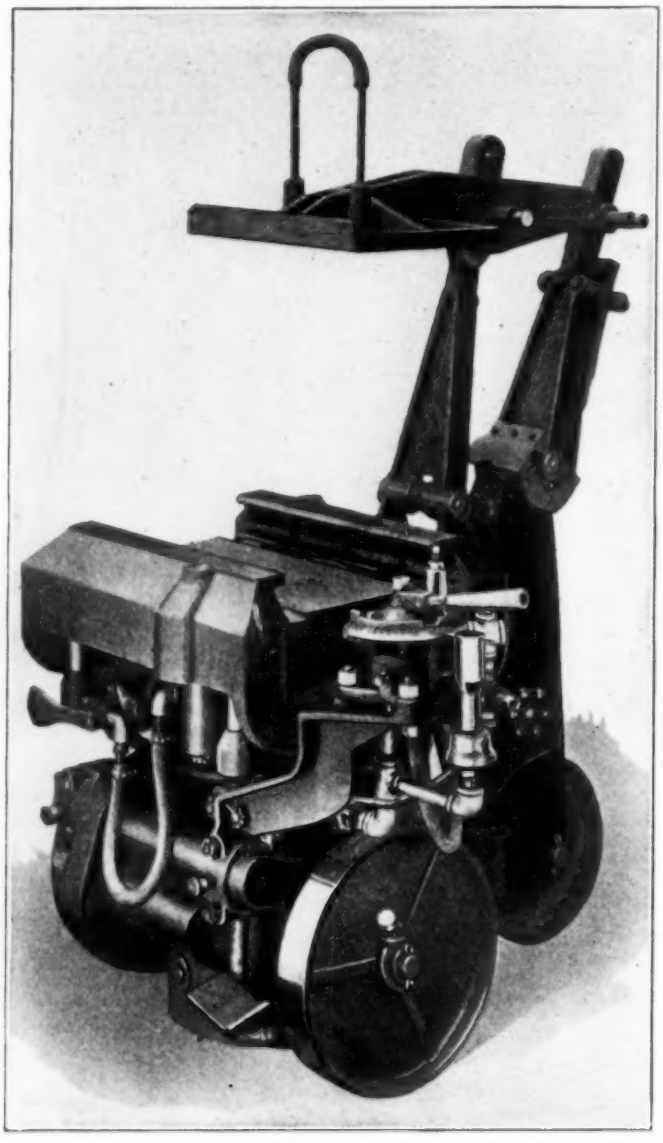
The Timken Roller Bearing Service & Sales Co., Canton, O., has appointed T. F. Rose, formerly assistant manager, Chicago branch, manager at Cincinnati. H. C. Sauer, formerly assistant manager, Cleveland, has been appointed manager at Detroit. Fred G. Rumball, formerly manager, Kansas City branch, has been promoted to sales engineer, automotive division, with headquarters at Cleveland. J. M. Carey will be manager of the Kansas City branch. The branch office at Baltimore now is closed.



REMOVABLE HANDLE ALLOWS TRUCK TO BE PLACED IN SMALL SPACE

Builds Jolt Squeeze Stripper Machine

The Osborn Mfg. Co., 5401 Hamilton avenue, Cleveland, recently has introduced a new jolt squeeze stripper molding machine which embodies several interesting features of construction. The jolt is operated by the left knee, leaving the operator's hands free to level the sand. The pattern draw plate is held in alignment by two heavy guide pins 1¼-inch in diameter. The guide pins are stationary in their bearings during jolting. The draw rod yokes are guided in two bronze bushings 17¼ inches apart. The yokes are tied together by a squaring shaft. The mechanism for supporting the draw yokes in the upward or pattern draw position engages in the center of the squaring shaft, equally distributing the load. The pressure is taken up in one direction and the wear is uniform. Automatic release valve with direct reading adjustment may be set at any desired squeeze pressure. When the predetermined pressure is reached, the valve automatically releases and prevents the mold from being over squeezed. This feature also is designed to give a uniform squeeze pressure on every mold. An open end lifting frame design is used which permits jobs of various lengths to be mounted without changing the lifting frames. The head of the machine is easy to operate. If the pressure is applied before the head is in the forward position, the head cannot be injured. When designing and building this machine, careful thought was given to the question of repair. Each working part readily is accessible for making any repairs.



THE MACHINE MAY BE SUPPLIED WITH OR WITHOUT WHEELS

is controlled by an automatic by-pass valve of special design. This valve permits a rapid pattern draw by quickly exhausting air in the cylinder to a pressure of approximately 5 pounds. The valve then closes automatically and the remaining air passes through an adjustable needle valve which controls the speed of the pattern draw at the critical point when the pattern is released from the sand.

The machine may be supplied with or without wheels. The lifting frame which supports the flask or stripping

Metal Blows Off Furnace Fire Pot Cores

Question: I should like to have your opinion on the cause of the heavy loss of cored fire pot castings. I maintain that the cores are responsible but the proper authorities apparently question my opinion. An ⅛-inch wax vent is placed in several strands for about half the total height of the core, then two ¼-inch rods are rammed at opposite sides and withdrawn to provide a passage for the vent. Blowholes appear in the top of the casting, the iron does not knit around the chaplets and from this evidence I am convinced that the gas does not escape properly.

Answer: We quite agree with you in the inference you have drawn from the appearance of the castings. Blowholes are produced by gas trying to escape through the iron and since they only appear on the upper side of the casting it is apparent that they were caused by something on the inside. The only debatable point in connection with your inquiry is whether the trouble is due to the core mixture or the method of venting the core. If the core mixture is at fault, the result may be neutralized to some extent by elaborate venting. However, this usually involves extra time, material and equipment. At best it is only a remedial measure. The practical and sensible procedure is to develop a satisfactory core mixture.

Sometimes a casting is designed in such a manner that it is impossible to take a vent off properly through the prints provided on the pattern. That is a feature to be taken up with the designer. In many instances it is necessary to provide extra vent openings in the casting. These afterward are tapped and plugged. A satisfactory mixture for cores of this character is made entirely from a fairly coarse grade of sharp sand bonded with a minimum amount of liquid binder and thoroughly dried. Practically all the radiator foundries employ linseed oil or one of the proprietary oil binders with a linseed base, but in the hands of men thoroughly accustomed to their use, other liquid binders have rendered satisfactory service. Without actually seeing the casting or a detail blueprint we are not in a position to determine whether or not two ¼-inch rods provide sufficient vent passage.

There is a possibility that the cores are not dried sufficiently, or, the core mixture may contain a quantity of molding sand added for the purpose of holding the core in shape while it is green. A core may be perfect in every particular so far as sand and venting are concerned and yet if it is not dried almost to the point of scorching, it will cause the metal to boil and form blowholes. The addition of molding sand lowers the permeability of the core and will cause trouble in a core practically surrounded with iron.

Midsummer Decline Minimized

Foundry Equipment Sales Hold Strength During Hot Season in Practically All Centers—Totals Ahead of Last Year's Reports

JULY is proving to be an unusual month for the sale of foundry equipment, according to reports from different centers. Contrary to the usual summer lull, activity has held up well through the entire midsummer, except for a few centers, notably New England, where foundry operations have been light. In Pittsburgh inquiry is widespread and centers largely on molding machines. The Reliance Steel Casting Co., Pittsburgh, the Elliott Co., Jeannette, Pa., and the United Cast Iron Pipe & Foundry Co., Scottdale, Pa., all are in the market for cranes, the inquiries having been pending for some time. The Westinghouse Electric & Mfg. Co., East Pittsburgh, also is reported to be in the market for two cranes for its plant at Mansfield, O. In the East an optimistic tone prevails. One maker of a general line of foundry equipment recently sold seven cupolas. These are for replacement or to supplement the present melting equipment of the purchaser plants. The G. L. Anderson Brass Works, Inc., Birmingham, Ala., of which Lloyd Johnson, formerly superintendent of the Joubert & Goslin Machine & Foundry Co., Birmingham, is vice president in charge of operations, will build a new nonferrous foundry to cost about $15,000. Cunningham Machine Works, Shreveport, La., G. F. Cunningham, president, is in the market for a gas-fired brass furnace and miscellaneous brass foundry and pattern shop equipment. In the Chicago district inquiries are active and orders follow closely.

Sales of foundry equipment in June declined only 4 per cent, compared with the preceding month and show an advance of 18 per cent over June, 1925, according to a report of the Foundry Equipment Manufacturers' association. The sales in May, 1926, were $425,638 and in June, 1926, they were $407,940 while in June last year they were $343,259. The orders on hand July 1 totaled $511,290 compared with $524,382 on June 1, while on July 1, 1925, they stood at $460,383. Shipments of foundry equipment showed a fractional per cent gain in June over May, 1926.

CLEVELAND MARKET

Dust Arresters

Almont Mfg. Co., Almont, Mich., dust arrester; Electric Auto Lite Co., Fostoria, O., dust arresting equipment from W. W. Sly Mfg. Co., Cleveland.

Ovens

Fremont Foundry Co., Fremont, O., firing equipment for oven from Mayor Fuel Saving Furnace Co., Cleveland.

Sand Preparing Equipment

Ohio Malleable Iron Co., Columbus, sand separator and screen and Maumee Malleable Castings Co., Toledo, sand mixer from National Engineering Co., Chicago.

Tumbling Mills

Farrell-Cheek Foundry Co., Sandusky, O., from W. W. Sly Mfg. Co., Cleveland.

Shakeout Equipment

Ferro Machine & Foundry Co., Cleveland and Dayton Steel Foundry Co., Dayton, O., from the Stoney Foundry Engineering & Equipment Co., Cleveland.

CHICAGO MARKET

Tumbling Barrels

Deere & Co., E. Moline, Ill., tumbling mill, from the W. W. Sly Mfg. Co., Cleveland.

Melting Units

Bonne Terre Foundry Co., Bonne Terre, Mo., cupola from the Whiting Corp., Harvey, Ill.

Cranes

Great Northern Railway, Seattle, Wash., 61-foot, 40-ton crane from the Whiting Corp., Harvey, Ill.

Ladles

Hughes Tool Co., Houston, Tex., two 7-ton ladles, from the Whiting Corp., Harvey, Ill.

Molding Machines

Oklahoma Steel Casting Co., Tulsa, Okla., two molding machines and Oklahoma Iron Works, Tulsa, Okla., one molding machine from Herman Pneumatic Machine Co., Zelienople, Pa.

Sand Preparing Equipment

Allis-Chalmers Mfg. Co., Milwaukee and King Mfg. Co., Sheffield, Ala., one sand mixer each from the National Engineering Co., Chicago.

Shakeout Equipment

Grimes Molding Machine Co., Detroit, from the Stoney Foundry Engineering & Equipment Co., Cleveland. John Deere Tractor Co., Waterloo, Iowa, Griffin Wheel Co., Kansas City, Kans., and Great Lakes Foundry Co., Port Huron, Mich., from the Stoney Foundry Engineering & Equipment Co., Cleveland.

NEW YORK MARKET

Sandblast Equipment

Lyon Iron Works, Greene, N. Y., sandblast and Wm. H. Barr, Inc., Buffalo, dust arrester from the Pangborn Corp., Hagerstown, Md.

General Electric Co., Philadelphia, and Gould Coupler Co., Depew, N. Y. Sandblast from the J. W. Paxson Co., Philadelphia.

Melting Units

A. Weiskittel & Sons Co., Baltimore, cupola from J. W. Paxson Co., Philadelphia.

American Radiator Co., New York, cupola, and two cupolas with complete pneumatic charging equipment for the Taylor Wharton Iron & Steel Co., Highbridge, N. J., from Whiting Corp., Harvey, Ill.

Sand Preparing Machinery

Otis Elevator Co., Buffalo, sand mixer and two special bucket loaders from the National Engineering Co., Chicago.

Shakeout Equipment

American Locomotive Co., Dunkirk, N. Y., from the Stoney Foundry Engineering & Equipment Co., Cleveland.

PITTSBURGH MARKET

Melting Units

U. S. Sanitary Mfg. Co., Monaca, Pa., cupola from the Whiting Corp., Harvey, Ill.

Cranes

Penn Mold & Mfg. Co., Dover, O., 10-ton motor driven and 3-ton hand power cranes from Whiting Corp., Harvey, Ill.

Westinghouse Airbrake Co., Wilmerding, Pa., 3½-ton crane from Northern Engineering Works, Detroit.

Ovens

Pressed Steel Car Co., McKees Rocks, Pa., five double rack core ovens from Foundry Equipment Co., Cleveland.

Allegheny Steel Co., Brackenridge, Pa., one mold drying oven from the J. S. McCormick Co., Pittsburgh.

Ladles

Hillsdale Plow Co., Hillsdale, N. Y., several large ladles from J. S. McCormick Co., Pittsburgh.

American Laundry Machine Co., Cincinnati, truck ladles; Pittsburgh Malleable Iron Co., three 9500-pound and one 11,000-pound bottom tap ladles; from Whiting Corp., Harvey, Ill.

Molding Machines

Pittsburgh Malleable Iron Co., two; Bessemer Gas Engine Co., Grove City, Pa., two; Lebanon Steel Foundry Co., Lebanon, Pa., two; Union Switch & Signal Co., Swissdale, Pa., one; National Tube Co., Ellwood City, Pa., one; all from Herman Pneumatic Machine Co., Zelienople, Pa.

Sand Preparing Equipment

Pittsburgh Steel Foundry Co., Pittsburgh, sand mixer made by Blystone Mfg. Co., Cambridge Springs, Pa., from J. S. McCormick Co., Pittsburgh.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., sand mixer and Titusville Iron Works, Titusville, Pa., sand mixer from National Engineering Works, Chicago.

Dust Arresters

Otis Elevator Co., Buffalo, N. Y., from W. W. Sly Mfg. Co., Cleveland.

Shakeout Equipment

Westinghouse Air Brake Co., Wilmerding, Pa., from the Stoney Foundry Engineering & Equipment Co., Cleveland.

NEW ENGLAND MARKET

Cranes

Lumsden & Van Stone Corp., South Boston, one 4-ton electric traveling crane from the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

Sandblast Equipment

Vulcan Iron Works, New Britain, Conn., from the Pangborn Corp., Hagerstown, Md.

Sand Preparing Equipment

Charles Parker Co., Meriden, Conn., from the National Engineering Co., Chicago. Union Mfg. Co., New Britain, Conn., from the same maker.

Melting Equipment

General Electric Co., West Lynn, Mass., from the Whiting Corp., Harvey, Ill.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Crucible Steel Casting Co., Milwaukee, has completed its new foundry at Fifteenth and Oklahoma avenue.

Maumee Malleable Castings Co., Toledo, O., will build a 1-story addition to its plant 60 x 65 feet.

John Deere Spreader Works, East Moline, Ill., is building a foundry addition 64 x 84 feet.

Wagner Malleable Iron Co., Decatur, Ill., is building an addition to accommodate five 50-ton muffle furnaces.

Graven Foundry & Machine Co., New Bern, N. C., has been incorporated with $100,000 capital by W. T. Brinson and C. C. Mason.

David Fitzgerald, Lagrande, Oreg., will rebuild the burned portion of his foundry recently destroyed.

J. Lefelore is building a foundry at Rigaud, Que., and is in the market for complete equipment.

East Penn Foundry Co., Macungie, Pa., is having plans made for considerable enlargement of its facilities for production of plumbing supplies.

Aetna Brass Mfg. Co., Cleveland, has been incorporated with 500 shares no par value by L. G. Rosenblum, E. Rosenblum, Jack Wilson, Esther Sontag and E. Carter.

Columbus Aluminum Castings Co., Columbus, O., has been incorporated with $20,000 capital by H. R. Gill, Dwight Goodman, H. F. Clawson, J. C. Middleton, and I. G. Slirgwolt.

Connecticut Malleable Castings Co., New Haven, Conn., has been incorporated with $100,000 capital to operate a foundry by Lewis L. Field, John R. Thim and Ellen Brommel.

Eastern Malleable Iron Co., Naugatuck, Conn., has let contract to the Clark Construction Co., Waterbury, Conn., for a 1-story addition 125 x 200 feet.

Textile Finishing Machinery Co., Sims avenue, Providence, R. I., has given contract to N. D. Benson, 36 Burrington street, for two additions, 1-story 64 x 100 feet each.

Udin & Cohen, New York, have been incorporated with $10,000 capital to manufacture bronze and iron products by A. Udin, E. Udin and I. Cohen.

The National Castings, Ltd., Belleville, Ont., is having plans prepared for new plant to replace the one destroyed by fire. Owners are interested in complete equipment. Norman Turner is general manager.

Aetna Machine Co., E. F. Abbey president, 3400 Maplewood avenue, Toledo, O., has let contract to A. Bentley & Sons Co., 201 Belmont avenue, for a 1-story addition 91 x 103 feet.

William Powell Co., H. H. Coombe president, 2521 Spring Grove avenue, Cincinnati, will build a foundry and machine shop 2-story 122 x 142 feet. General contract to J. F. Harig Co., 1240 Queen City avenue.

Abingdon Sanitary Mfg. Co., Abingdon, Ill., is having plans made by S. Cutler, architect, 137 South LaSalle street, Chicago, for six 1-story buildings for the manufacture of plumbing supplies.

Globe Pattern Works, D. W. Valentine manager, 315 East Kalamazoo street, Kalamazoo, Mich has let contract to A. G. Loughead, 714 Eleanor street, for a 2-story shop 40 x 65 feet.

American Car & Foundry Co., Railway Exchange building, 80 East Jackson boulevard, Chicago, will build a crane runway 100 x 313 feet at its South Wood street plant and a 1-story addition 100 x 315 feet at its South Paulina street plant.

Chicago Pneumatic Tool Co., Gary C. VandenBoom district manager, 572 West Randolph street, Chicago, has let contract to E. W. Sproul Co., 2001 West Pershing road, for a 2-story plant 50 x 260 feet at 3655 Iron street.

N. D. N. Corp., Lebanon, N. H., has been incorporated with 1000 shares no par value to operate a metal, woodworking and foundry plant, by Caleb H. Niles president, Alfred J. Densmore treasurer, Herbert V. Palumbo clerk, Lebanon, N. H.

Industrial Iron Works Inc., Jersey City, N. J., has been incorporated with $100,000 capital to manufacture brass fittings by William V. Bechtold, North Bergen, N. J.; Jacob Bertram, Clifton, N. J.; Ernest P. Cupo, Jersey City, N. J. Melosh, Morton & Melosh, Jersey City, are attorneys.

In connection with proposed plant for the Manitoba Steel Foundries, Ltd., Selkirk, Man., to replace one destroyed by fire a number of contracts have been awarded and construction work is under way. The general contract has been awarded to Fraser & MacDonald, Winnipeg; structural steel and reconditioning of steel from old plant, Dominion Bridge Co., Winnipeg; all reinforcement to Manitoba Rolling Mills, Selkirk; and the Manitoba Bridge & Iron Works has contract for reconditioning certain equipment. The new building will be of reinforced concrete, brick and tile, with steel framework, and will cost $300,000. (Noted June 15).

New Trade Publications

BRINELL TESTING—A proving ring to check the accuracy of the brinell testing machine is shown in a folder published by the Morehouse Machine Co., York, Pa.

HAND CRANES—Various types of hand cranes are described in a catalog issued by Herbert Morris Inc., Buffalo. Typical installations are shown and the specifications given.

GAS COMPRESSORS—Sullivan Machinery Co., Chicago, has issued a bulletin describing compressors for gas lines. The features of the compressors are shown with some typical installations.

ALUMINUM—Aluminum and its alloys in the fabrication of the new gasoline-electric passenger busses is the subject of a pamphlet issued by the Aluminum Co. of America, Pittsburgh.

PUMPING—Automatic control of centrifugal pumps for mine dewatering purposes is described in a 22-page bulletin issued by Barrett, Haentjens & Co., Hazelton, Pa. Advantages of using this method also are given.

VALVES—A modulating valve for the regulation of steam pressure in radiators is shown in a folder published by Jenkins Bros., Bridgeport, Conn. A phantom drawing gives the essential features of the valve.

CASTINGS—A pamphlet describing the advantages of pearlite iron used for castings requiring strength has been mailed by the Whiting Corp., Harvey, Ill. This cast iron is used in products manufactured by that firm.

PNEUMATIC CONVEYING—Dust Recovering & Conveying Co., Cleveland, has issued a bulletin showing how its equipment is used in unloading and conveying fine materials from car to bins, with lessened labor and losses.

MOLDING MACHINES—Sand throwing molding machines manufactured by the Beardsley & Piper Co., Chicago, are described in a 48-page catalog recently issued. The catalog is illustrated well with photographs of typical installations.

OIL ENGINES—Ingersoll-Rand Co., New York has published a 32-page catalog decribing the features and operation of the oil engines manufactured by that firm. The catalog is illustrated with pictures of typical installations used for various purposes.

BLOWER SYSTEMS—Collecting, conveying and ventilating blower systems manufactured by the Kirk & Blum Mfg. Co., Cincinnati are described in a 50-page catalog. Illustrations of typical industrial installations show the various applications of these systems.

ALLOYS—International Nickel Co., New York, has issued two pamphlets on the use of nickel and nickel-chromium in improving the properties of gray cast iron. The induction of the alloy into the metal and the results obtained are described.

ABRASIVES—Various types of grinding wheels and abrasives manufactured by the Abrasive Co., Philadelphia are described in a 210-page catalog recently published. Sizes and prices of wheels and grain size and prices of abrasives are given.

PYROMETERS — Bowen Instrument Co., Leeds, England, has published a pamphlet describing its radiation pyrometer for determining temperatures over 500 degrees Centigrade. Construction, principles of operation and the advantages of this type of instrument are enumerated.

GRAPHITE—An outline of the six important uses of graphite in industry is given in a folder issued by George F. Pettinos, Philadelphia. The four properties of smooth, flaky structure, black color, heat resistance and inertness to chemicals render graphite almost indispensible for certain purposes.

ELECTRICAL—General Electric Co., Schenectady, N. Y., has published four pamphlets describing various equipment for power installations. The pamphlets include two on squirrel cage motors, one on explosion chambers for oil circuit breakers and one on automatic starting compensators for induction motors.